

STEEL+ TECHNOLOGY

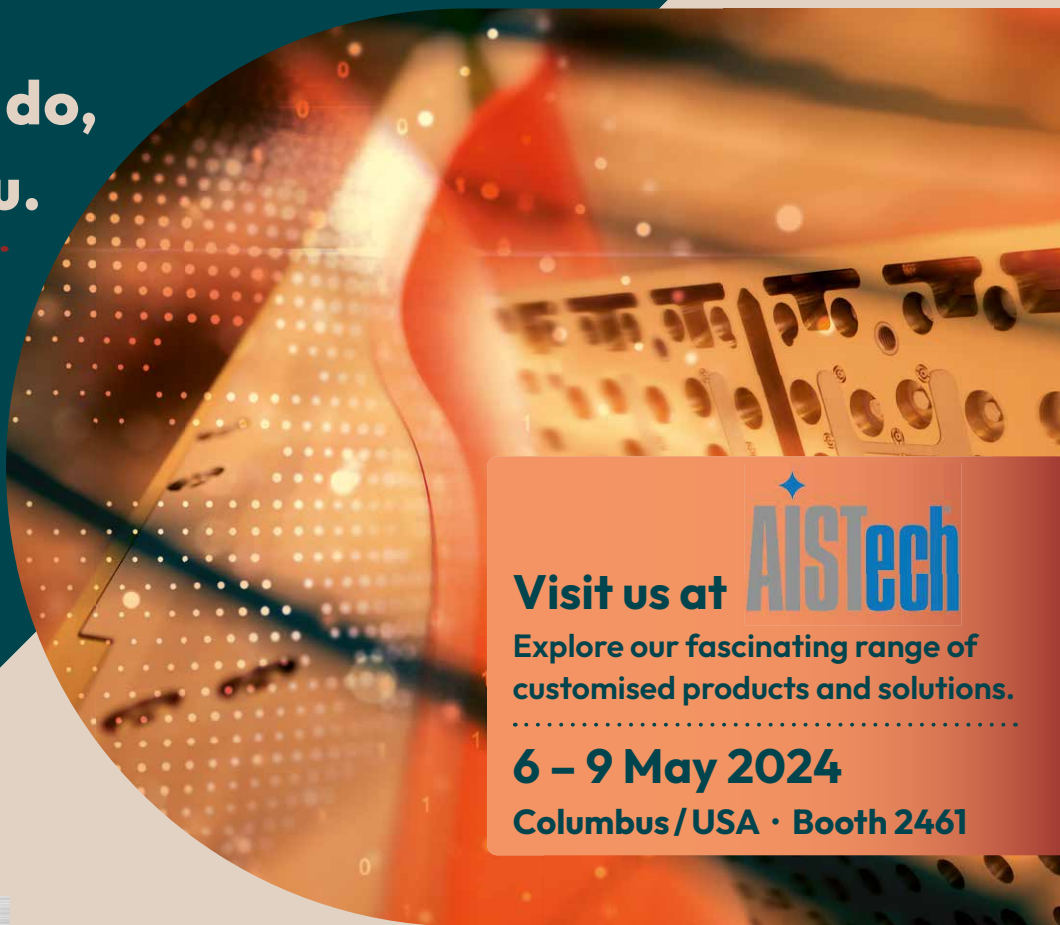
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DECARBONIZATION

Construction of test facilities for DRI and hot metal at thyssenkrupp Steel

ECONOMY

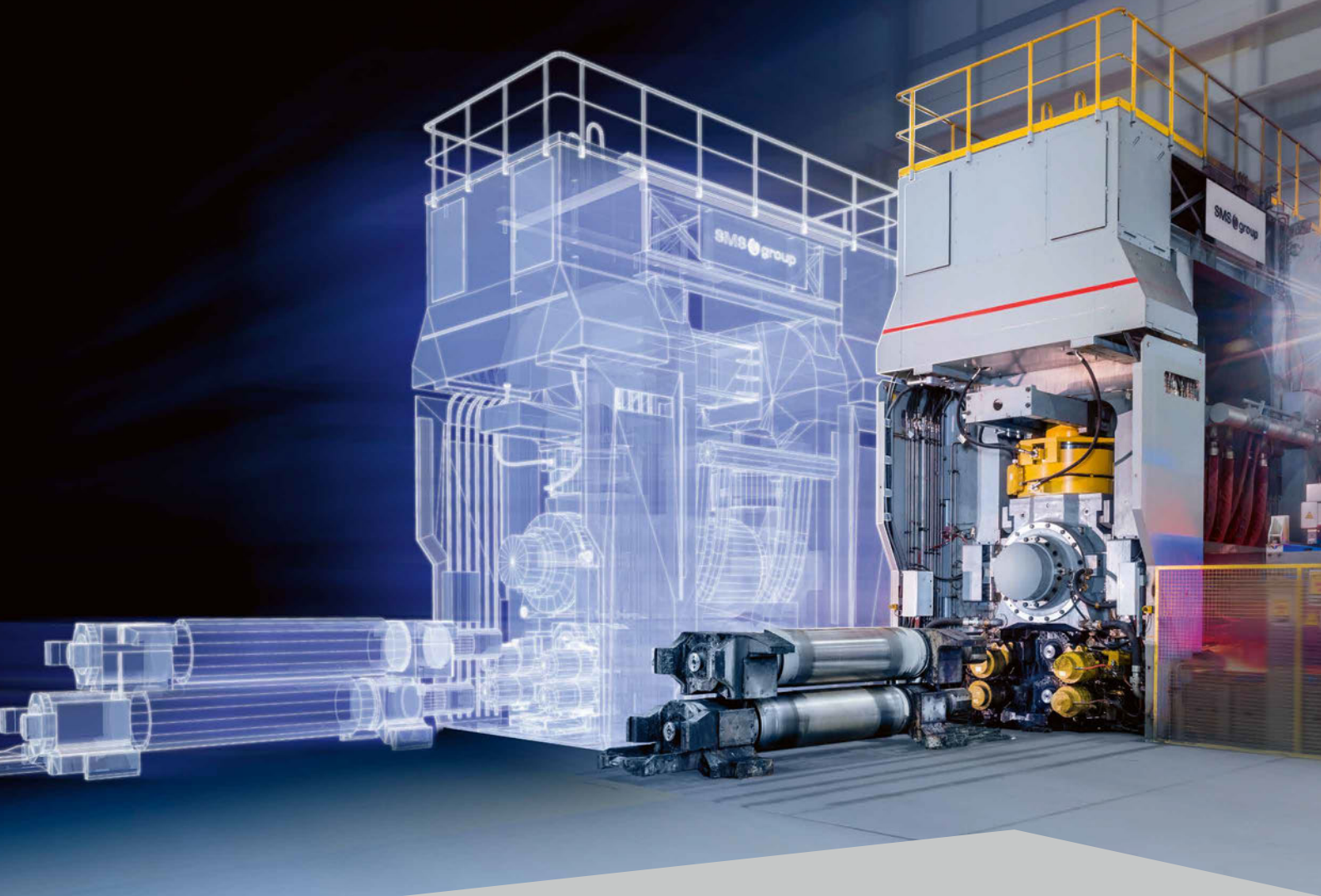
worldsteel's forecast for global steel demand in the period 2024 and 2025

CASTING AND ROLLING

Technologies for advanced flat products at voestalpine, Jindal Steel and Hyundai Steel

ADDITIVE TECHNOLOGY

3D printed and laser hardened punching tools for ageing coil strapping machines



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Challenging green steel technologies

When discussing the challenges associated with the transition from coal-based steelmaking (BF-BOF route) to the climate-friendly direct reduction and electric arc furnace (DR-EAF) route, the focus is primarily on financial investment. The transformation concepts for many integrated steel mills have long since been drawn up, the financing of the projects secured and the necessary new DR plants and EAF steel mills or other smelters ordered. The CAPEX side of the transformation now seems to have been largely discussed. However, the operational side of the climate-friendly DR-EAF route has raised a number of questions and brought the R&D experts to the scene. Jarmo Lilja, Process Development Manager at SSAB, puts it in a nutshell: "Although the principle of fossil-free steel production is well known, there are still many challenges to overcome by 2030".

There are a number of challenges involved, so in this issue we look at the key topics for you, and how individual companies are tackling them. Let's stay in Scandinavia, where the Finnish steel sector is developing skills in fossil-free steel. A joint project brings together ten companies and three research institutes to develop their skills and business in fossil-free steelmaking. According to SSAB, the transition to fossil-free steelmaking will have a far-reaching impact on the technologies involved. **(page 30)**

Germany's largest steel company has also recognised that the transition must be accompanied by intensive research and development. thyssenkrupp Steel has already started the major investment project, but is now setting up additional test facilities for direct reduction and smelting technologies to promote research into electric hot metal from hydrogen-based direct reduction. **(page 26)**

Finally, we continue to report on the most important raw material for the future fossil-free direct reduction plants. Recently, international analysts Research and Markets published their new Global Iron Ore DR Pellets Market Report, which shows the market trends for this raw material that many steel companies might be interested in processing in the near future. **(page 28)**

STEEL + TECHNOLOGY will keep you continually informed of the progress of all these developments.



Arnt Hannewald,
Dipl.-Ing., Editor

Arnt Hannewald



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Marcegaglia processes approx. 1 million t per year of specialty steel products in all shapes

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New slitting line supports supply of NO electrical steel to automotive industry



Alleima shares carbon footprint data with Sandvik for more transparency in PCF

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EUROPE – AUSTRIA

Long-term Chief Financial Officer Robert Ottel leaves voestalpine

Robert Ottel, Chief Financial Officer of voestalpine for 19 years, has decided to pursue new professional challenges and not to extend his contract.

During his time as Chief Financial Officer, Robert Ottel played a decisive role in helping voestalpine grow into a leading international steel and technology group. It was under his financial leadership that the group adopted a much more international focus, involving over 30 company acquisitions.

Ottel started his career at voestalpine in 1997 as a participant in the group's internal global development program, quickly progressing to management positions at group sites around the world. As head of the motion division, Ottel became a member of the management board of voestalpine AG in 2004. In 2005, he was appointed as CFO of the entire group.



Robert Ottel leaves voestalpine after almost twenty years as Chief Financial Officer
(Photo: voestalpine)

voestalpine

voestalpine Stahl orders new coke-oven machinery

voestalpine Stahl has awarded a contract for the supply of two new coke transfer cars to Danieli Corus and industrial automation and coke plant machinery specialist INperfektion.

The two new coke transfer cars will replace the existing machinery in use at voestal-

pine Stahl's No. 1 coke plant in Linz. The transfer cars will have fully integrated hood systems to minimize emissions during coke pushing operations. They will be equipped with door extractor, frame cleaners, door cleaners, coke guide cage and spillage coke handling system and be designed to operate in fully automatic,

semi-automatic, manual and "repair and maintenance" modes.

voestalpine

EUROPE – FRANCE

ArcelorMittal acquires strategic stake in Vallourec

ArcelorMittal has signed a share purchase agreement to acquire shares representing an approximately 28.4% equity interest in Vallourec.

Having carried out a successful restructuring in recent years, Vallourec presents a compelling opportunity to increase Arce-

lorMittal's exposure to the downstream, value-added tubular market. It is a global leader in premium tubular solutions for energy markets and demanding industrial applications, offering innovative, safe and competitive products for sectors including energy, automotive and construction. 85% of Vallourec's 2.2 million t of annual rolling

capacity is focused around low-carbon, integrated production hubs in the USA and Brazil. ArcelorMittal does not intend to launch a tender offer for Vallourec's remaining shares over the next six months.

ArcelorMittal



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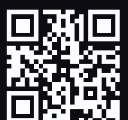
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EUROPE – FINLAND

Outokumpu to reduce carbon emissions from short sea liner operation

Outokumpu is deepening its long-term transport collaboration with Finnish shipping company Langh Ship, by taking into use new energy-efficient and low-emission vessels during 2024.

The first multipurpose vessel, Lovisa, has started its liner service for Outokumpu between Finland and the Netherlands. Outokumpu aims to have six vessels from Langh Ship in use during the year with a target to reduce Outokumpu's annual carbon emissions from short sea shipping by at least 25% by the end of 2024. The col-

laboration presents a positive outcome from the opportunity aligned with tightening environmental regulations from both the EU and the International Maritime Organization (IMO), allowing Outokumpu and Langh Ship to navigate the evolving regulatory landscape while pursuing sustainability targets.

The new and more versatile vessels can take more tonnages out from Outokumpu's road traffic to sea and further reduce the company's carbon footprint from transport. As Tornio and the sea channel leading to it is covered by ice half

of the year, Lovisa has been built for ice class 1A to endure the northern winter conditions. The vessel is equipped with a dual fuel main engine. In the future, the vessel can be converted to run with various fossil-free fuels. As the initial fuel it will use liquefied natural gas, which can be directly replaced by liquefied biogas. Furthermore, the vessel is prepared for installation of onshore power, which would make it emission-free during port calls.

■ *Outokumpu*

Outokumpu and Q Power to explore synthetic methane production

Outokumpu is going to explore the potential of carbon capture utilization (CCU) technology as a means to utilize the company's emissions as raw materials to produce new products such as e-fuels.

As part of these efforts, Outokumpu has signed a memorandum of understanding with Q Power, a Finnish Power-to-X technology provider, to explore the production of synthetic methane at Outokumpu's largest site in Tornio. Synthetic methane or

e-methane is a synthetic gas produced from renewable hydrogen and recycled CO₂. E-methane is fully interchangeable with natural gas and biogas. When it is liquefied, it is likewise fully interchangeable with LNG and it can be transported through already existing infrastructure.

The agreement targets to establish an in-depth understanding of the ecosystem needed around synthetic methane production from technical, financial and commercial aspects. The project supports Outo-

kumpu's decarbonization targets as it explores the possibility to capture carbon monoxide and carbon dioxide from the company's production processes and use them as raw material to produce synthetic methane. The primary aim would be to produce e-fuel to reduce reliance on fossil sources such as LNG.

■ *Outokumpu*

EUROPE – GERMANY

voestalpine plans to sell Buderus Edelstahl

Following the restructuring steps already taken in the past, the management board of voestalpine AG has decided to transfer the strategic process initiated to reposition Buderus Edelstahl into a sales process.

The management board is reacting to the changed economic conditions for industrial manufacturing companies and is reorganizing production sites in Germany. This step is a consistent implementation of voestalpine group's strategy of focusing the materials business on the highest quality spec-

trum and expanding the downstream business in promising global segments.

According to this, the High Performance Metals Division, of which Buderus Edelstahl is currently a part, is concentrating its product portfolio on the high-tech segment of special materials and reducing the production share of tool steel and engineering steel in the standard grade area. The resulting optimization of the product portfolio strengthens the High Performance Metals division's competitive position.

In Automotive Components, the management is maintaining its internationaliza-

tion strategy, but is making targeted adjustments in response to the structural underutilization of capacity in the automotive supply industry in Germany. The management has already responded by consolidating the production network, including the sale of the production site in Nagold.

Against this backdrop, the Metal Forming Division is reorganizing its Automotive Components business in Germany and has adjusted its planning assumptions accordingly.

■ *voestalpine*

EUROPE – GERMANY

ArcelorMittal Germany receives funding approval from the EU Commission

The EU Commission has approved the financial support for the transformation project for climate-neutral steel production at ArcelorMittal's Bremen and Eisenhüttenstadt sites.

"The EU approval is a significant milestone on our path to climate-neutral production – we are very pleased about this. We are now moving forward to plan the technology change in production," explains Dr. Thomas Bünger, CEO of ArcelorMittal Bremen and Eisenhüttenstadt.

The technical planning for the use of the new production technology with a hydrogen-fueled direct reduction plant and three electric arc furnaces, which are to be operated with green electricity, will take place now so that the global ArcelorMittal group can then make an investment decision. In addition to the development of infrastructure, the assessment of whether sufficient quantities of green electricity and hydrogen will be available at internationally competitive prices will be an important factor in the investment decision.

| ArcelorMittal

Salzgitter sells Mannesmann Stainless Tubes to Cogne Acciai Speciali

Continuing its active portfolio management, the Salzgitter group has sold Mannesmann Stainless Tubes (MST) to the Italian company Cogne Acciai Speciali.

Cogne Acciai Speciali is an international group of companies with production facilities on three continents, manufacturing long products in stainless steel (austenitic, martensitic, ferritic, duplex and super-duplex grades) and nickel-based alloys for aerospace, automotive and energy industry. The company also serves the medical technology sector, the food industry, chemical and plant engineering, in addition to general mechanical engineering.

Mannesmann Stainless Tubes produces seamless stainless steel and nickel-based tubes at its sites in Germany, France, Italy and the USA. As a stainless-steel tube manufacturer, MST is not integrated into the Salzgitter Group's supply of primary materials.

| Salzgitter AG / Cogne Acciai Speciali



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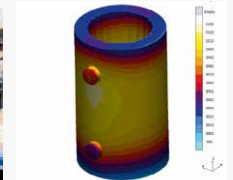
1 000 kg up to 120 000 kg in one piece.

• **Materials:**

cast iron in different grades.

• **Technical support:**

new products design or existing solutions improvement.



HEAVY CASTINGS FROM POLAND

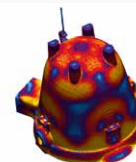
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EUROPE – GERMANY

cunova to acquire aerospace specialty metals business of KME

cunova GmbH and SEDA (SDCL EDGE Acquisition Corporation) have entered into a definitive business combination agreement, under which cunova will be indirectly acquired by a publicly-listed, successor entity of SEDA. Also as part of the proposed business combination, cunova will acquire KME Aerospace from KME group.

Headquartered in Osnabrück, Germany, cunova is a leading global producer of mission-critical copper alloy products and related services and solutions for a diverse array of end markets including casting,

maritime, industrial and energy. cunova's acquisition of the whole aerospace specialty metals business of KME group would enable the combined company to also serve the space exploration and general aerospace markets. The combined company is expected to be listed on the NYSE.

cunova is dedicated to resource efficiency and the circular economy. In 2023, over half of the copper used to make cunova's products was sourced from recycled scrap. "We are excited to join forces with KME Aerospace, which we believe will give us access to a new, exciting, and

high-growth end market. Space exploration activity is currently outpacing the reusability rate of engines and we expect this could triple our addressable copper component market opportunity from 2023 to 2030. As an established provider of mission-critical rocket engine components to nearly all the western tier one companies in the space exploration sector, we believe KME Aerospace currently has a first mover advantage in this end market," added Werner Stegmüller, CEO of cunova.

■ *cunova*

Salzgitter signs long-term power purchase agreements for green steel production

Salzgitter Flachstahl GmbH has concluded two long-term power purchase agreements (PPA) for green electricity: one with Octopus Energy Generation for the supply of 126 GWh/year and one with IG Merbitz Solar for the supply of 71 GWh/year. Both contracts will run for a period of 10 years.

The deal with Octopus, closed with the advisory team of Pexapark, comes as Octopus supercharges its green energy activity in Germany, as it plans to channel more than 1 billion euros into Germany's clean energy infrastructure by 2027. Octopus acquired the Schiebsdorf solar farm earlier this year on behalf of the Sky fund (ORI SCSp) it manages. Currently under construction and due to enter operation later this year, it is the largest solar farm in the firm's growing renewable energy portfolio in Germany and across the globe.

For the second green electricity supply agreement, Salzgitter is partnering with

Energiesysteme Groß GmbH & Co. KG and Agrarbetrieb Gut Merbitz GbR on their PV project in Wettin-Löbejün. The contract was signed with IG Merbitz Solar GmbH, the project company for the PV power plant in Merbitz. The electricity will be generated by a ground-mounted photovoltaic system currently under construction at the Merbitz site in Saxony-Anhalt. In concluding this power purchase agreement, Salzgitter Flachstahl has secured the supply of around 71 GWh/a of green electricity from Merbitz at a fixed price for 10 years as from January 2025, in addition to the option to temporarily store this electricity on site.

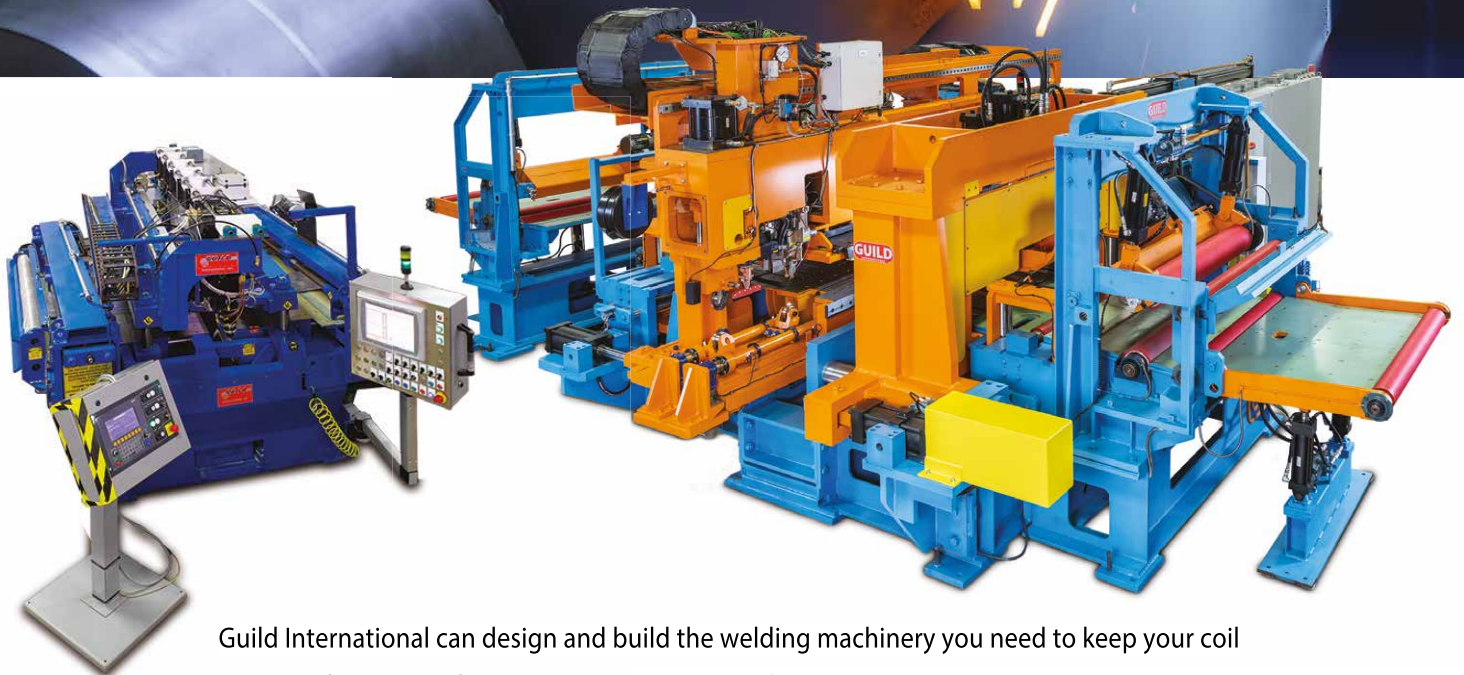
"The electricity supply agreements now concluded underline the importance of renewable energies for the energy transition in Germany and for the Salzgitter site – where virtually CO₂-free steel will be produced from 2026 onwards", says Ralph Schaper, Head of Energy Management, Salzgitter Flachstahl.

The sustainably produced energy further secures the ongoing SALCOS® – Salzgitter Low CO₂ Steelmaking transformation program. The green electricity from the photovoltaic systems will initially be part of Salzgitter Flachstahl's normal "electricity procurement portfolio". The long-term plan is to use the electricity to produce green hydrogen, which represents a core element in the Salzgitter group's production of virtually CO₂-free steel.

■ *Salzgitter AG / Octopus Energy Generation / IG Merbitz Solar*



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EUROPE – ITALY

Acciaierie d'Italia placed into extraordinary administration by Italian government

The Italian government has placed Acciaierie d'Italia SpA (ADI) into extraordinary administration subsequent to the request of Invitalia. Control of the company thereby passed from its current shareholders, ArcelorMittal and Invitalia, to government appointed commissioners.

This ends ArcelorMittal's involvement in Acciaierie d'Italia SpA, which started in 2018. Since that time, ArcelorMittal has been fully committed to the people and assets of ADI – formerly known as Ilva – investing over 2 billion euros. This investment enabled ADI to complete an extensive environmental programme on time

that ensured compliance with the Integrated Environmental Authorisation set out by the Italian government, as well as invest more than one billion euros in upgrading equipment at all sites. ADI also benefited from hundreds of millions of euros of credit through the provision of raw materials by ArcelorMittal.

ArcelorMittal had been keen to address the significant discrepancy in capital investment into ADI by the two shareholders. In recent discussions ArcelorMittal put forward pragmatic proposals to address this while continuing the public-private partnership with Invitalia that was established in April 2021. The discussions, however, were not successful.

Had ADI been able after April 2021 to access traditional debt financing and been able to raise the working capital required to fund its ongoing needs, rather than relying on equity injections from its shareholders as its sole source of capital, this situation could have been avoided. ADI's financial situation has been further impacted by the Italian Government delivering less than one-third of the 2 billion euros of support measures it offered to at the time the public-private partnership with Invitalia was established.

■ *ArcelorMittal*

EUROPE – LUXEMBOURG

Aperam to introduce digital sourcing solution

Stainless steel producer Aperam will implement a digital procurement solution from Metalshub, a specialist software provider for the metals and mining industry.

Metalshub's software solution provides a cloud-based source-to-contract functionality for all types of raw materials, including base metals, scrap and ferroalloys, enabling Aperam to access a global network of suppliers and obtain real-time mar-

ket insights. Aperam will seamlessly integrate Metalshub's specialized solution into its IT and ERP landscape.

"Raw material procurement is one of the main drivers of profitability for a stainless steel mill. To do it well requires an industry-specific, digital approach," says Dr. Sebastian Kreft, co-founder and managing director of Metalshub.

Dr. Frank Ehrenberg, Managing Director at Aperam Sourcing, commenting on the introduction of the new software: "The

partnership makes me convinced that the future of raw material procurement will be with more digital intelligence. It marks a significant milestone for Aperam's journey toward digital transformation and compliant practices."

■ *Aperam / Metalshub*

EUROPE – TURKEY

Kroman Çelik to build new electric arc furnace

Kroman Çelik has placed an order with Danieli for a Digimelter electric arc furnace to be installed in parallel with the existing melt shop, supplied by Danieli in 2010.

The Digimelter EAF for Kroman Çelik will have a tapping capacity of 150 t and be coupled with the Danieli endless charging

system. It will be equipped with technologies following a "zero man around" concept and allowing full flexibility in the EAF charge mix, ranging from up to 70% of virgin material such as HBI. The Q-One power feeder system will allow renewable energy sources to connect directly into the power system by the DC link. The order from Kroman Çelik also includes a twin-la-

dle furnace and auxiliaries such as fume and water treatment plants. Commissioning of the new plant is scheduled for the end of 2025.

■ *Danieli*

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CORPORATE M&A CHALLENGES

Marcegaglia streamlines migration of users after a major acquisition

CoreView helps Marcegaglia seamlessly manage post-M&A technology. In fact, it assists Marcegaglia's IT team migrate new users and manage mailboxes



Headquarters of Marcegaglia Group in Gazoldo degli Ippoliti, Mantova, Italy (Picture: Marcegaglia)

Marcegaglia, the leading Italian steel processing company, is in partnership with CoreView, the leading Microsoft 365 management platform, to simplify the integration of over 500 users following a major M&A. Marcegaglia and CoreView successfully migrated the users, saving three days and enabling Marcegaglia's IT team to work more efficiently, eliminating delays and routing issues.

Marcegaglia is an Italian corporation founded in 1959 by Steno Marcegaglia. It operates in the US, European and worldwide steel markets. Corporate mergers and acquisitions challenge large organizations as they must manage business continuity, processes, and tools. While M&As present strategic opportunities, they also require attention to avoid disrupting day-to-day activities, productivity, and the performance of administration and management operations. This has to go right to optimize communication and collaboration and foster a cohesive and productive work culture.

Biggest acquisition in Marcegaglia's history

With an output of 6.5 million tonnes of finished products and a turnover of 9 billion euros (2023) Marcegaglia is a major player on the international steel scene with a product range that covers everything from carbon to stainless steel, from long to flat products, from commodity to specialty.

In 2022 the Marcegaglia Group signed an agreement to acquire all the major companies in the stainless-steel long products division of Outokumpu, a Finnish multinational world leader in stainless steel production. The transaction included five plants spread across Europe and the USA: an EAF steel mill for specialty steels in Sheffield (UK), where the wire rod rolling plant and bar production plant are located.

In addition, there has been a bar production plant in Richburg (USA), a wire rod hot rolling plant and a drawn wire production plant in Fagersta (Sweden). These units ended 2022 with a total turnover of almost 1.3 billion euros and employed approximately 650 people. "This is the greatest acquisition made so far in our history", commented Antonio and Emma Marcegaglia, president and vice president, respectively, of the Group. For the first time in its history, the Marcegaglia Group invested in a primary steel production. The acquisition was closed in early January 2023 after having received the approval from both the European Commission and the US Competition Authority.

CoreView has given us a more comprehensive overview and made governance more effective.

Renzo Rossi, CTO, Marcegaglia

In a recent acquisition, Marcegaglia was faced with integrating employees into the company's technology. It was important to minimize confusion and mitigate the loss of correspondence with employees and outside contacts. Seamless integration, ensuring effective user management. Careful migration and consolidation of user accounts were required to seamlessly transition all employees to Marcegaglia systems.

With CoreView, Marcegaglia could migrate and consolidate user accounts to transition all employees to the Marcegaglia IT systems. CoreView implemented policies to identify newly created but temporarily unused accounts and hid them from the internal address book while con-

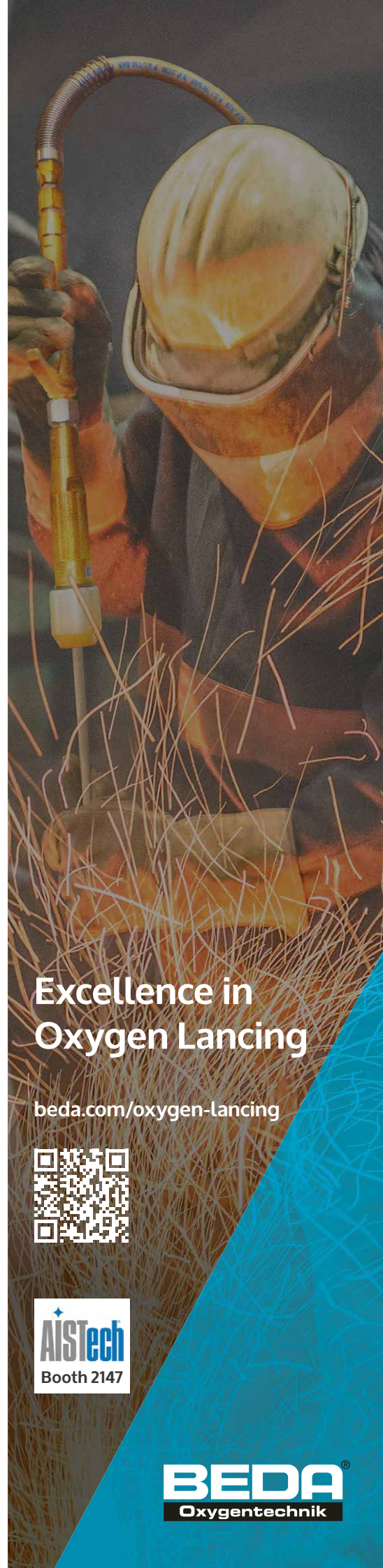
figuring an out-of-office message to inform colleagues that the mailbox wasn't yet active. CoreView also added workflows to remove the messages when the mailbox was reactivated.

"CoreView has allowed us to improve Microsoft 365 tenant management. In particular, it has given us a more comprehensive overview and made governance more effective," said Renzo Rossi, CTO, Marcegaglia. "In this way, it was possible to identify areas for optimization and automate several tasks that would otherwise have been time-consuming."

CoreView



Marcegaglia processes approx. 1 million t per year of specialty steel products in all shapes (Picture: Marcegaglia)



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MAJOR INVESTMENT IN NORTH AMERICA

Intocast to built mega class factory for refractories in Tennessee, USA

The new, state-of-the-art production plant will be dedicated to the manufacture of MgO-C refractories and materials specifically for the American market



The Intocast team at the groundbreaking (from left to right): Marcel Mix, Luis Reyes, Jim Cherkis, Matthias Normann (CEO Intocast group), Andy Toner, Damian Rider (COO Intocast group) (Picture: Intocast)

We will provide our customers with access to the highest quality refractories and on-site services available.

Matthias Normann, CEO of Intocast AG

With this significant investment Intocast marks a pivotal expansion of its operations in the United States, emphasizing its commitment to innovation, sustainability, and proximity to the customers. For over 45 years, the company has been a recognized expert in refractories, the essential materials that helps shape the steel industry. The legacy of innovation and unwavering commitment to quality has earned the trust of leading customers worldwide and the new Tennessee plant is the latest example of how the company tailors its global

strengths to meet the specific needs of the American steelmaking industry.

The new facility in Huntingdon, Tennessee provides excellent infrastructure and logistics capabilities, including river transport. The choice of location reflects the company's strategic planning to leverage the area's investment-friendly environment, ensuring a swift and efficient supply chain to meet the possibilities in the American market. With an initial investment exceeding 20 million USD in Phase 1, Intocast USA is set to bring over 100 full-time jobs to the local economy within the next five years. The project's Phase 2 is expected to even exceed the initial investment and introduce an additional 50 jobs, underscoring Intocast's role in stimulating economic growth and attracting further investments to the region.

The new plant will boast an annual production capacity of 40,000 tons of refractory material in Phase 1, with scalable plans for expansion. Embracing the latest tech-

nology, including robotics and Artificial Intelligence for process and quality control, Intocast USA sets a new industry standard.

The facility will feature a low-emission furnace made in Germany, full integration of product waste into a 100% circular economy, and state-of-the-art R&D and quality labs, illustrating an unwavering commitment to quality and environmental stewardship.

Intocast USA aims to foster strong community ties, particularly in supporting local education and workforce training. Through collaborations with local technical schools and international training programs, the company is dedicated to nurturing a skilled workforce comprising boiler makers, maintenance workers, robot experts, accounting and administration.

After the ground breaking ceremony on the green field on March 5, the construction is set to commence in July 2024, with Intocast USA working closely with local

authorities to ensure compliance with all regulatory approvals and environmental standards.

"We are not just building a new plant; we are forging a new chapter for Intocast in American steelmaking," states Intocast AG CEO Matthias Normann. "Our new American megaclass factory will not only provide our customers with access to the highest quality refractories and on-site services available but will also bring jobs and economic growth to the region."

"This investment is just the beginning of Intocast long-term vision for growth and innovation in the USA. As we move forward, we remain committed to our core values of excellence, partnership, and sustainability, ensuring a brighter future for our industry and the communities we serve."

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- **TOP-Injection-Process (TIP^{Pat.})** at LF for re-carburizing
- **Slag Suppression Systems** for slag volume reduction
- **Aluminium Injection Systems** for deoxidation
- **Desulphurization Technology** for Steel & Pig Iron
- **Gunning Systems**
- **Development** of specific customized process technologies
- **Ceramic lined products**, i.e. flexible lined ceramic hose

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THE AMERICAS – USA

Cleveland-Cliffs completes blast furnace hydrogen injection trial

Cleveland-Cliffs has successfully completed a hydrogen injection trial at its Indiana Harbor No. 7 blast furnace, the largest blast furnace in North America.

Cliffs recently completed the commissioning of the hydrogen pipeline at Indiana Harbor, which was used for this trial. This successful commissioning marks another significant achievement toward Cliffs' future GHG reduction efforts, completing the pipeline in advance of schedule, below

budget and without incident. Cliffs' hydrogen gas supplier, Linde, was a critical partner in the successful execution of this major trial.

Lourenco Goncalves, Cliffs' Chairman, President and Chief Executive Officer, said: "Indiana Harbor No. 7 is the largest blast furnace in North America and we are proud of our ability to be ahead of the curve in using this cutting-edge technology to decarbonize, while maintaining both our efficiency and the high standard of

quality that comes with steel produced via the blast furnace route. I congratulate my team on another major step forward. I also thank Linde for their valuable contribution." The Indiana Harbor furnace is the second Cleveland-Cliffs blast furnace to utilize hydrogen as a reductant and fuel source, following the successful trial at Middletown works in May of 2023.

■ *Cleveland-Cliffs*

JSW USA appoints new Chief Executive Officer

JSW Steel has appointed Robert Simon as the Chief Executive Officer of JSW USA. He will lead the overall business comprising slab, coil, pipe & plate production and sales at Baytown and Mingo Junction.

An industrial engineer from West Virginia University, Robert Simon began his professional career as a production manager,

and eventually as general manager for Oregon Brass Works. He held several key positions at Evraz North America's Rocky Mountain Steel Mills eventually becoming the vice-president & general manager and later the executive vice-president for the company's Tubular Division. His career then expanded to Steel Dynamics, taking the role of vice-president structural products. Prior to joining JSW USA, he consult-

ed with several companies including OmniTrax in Denver Colorado. Robert Simon has also served on the executive committee and as chairman of the Steel Manufacturers Association in the USA and as a board member of the American Institute of Steel Construction.

■ *JSW Steel*

THE AMERICAS – BRAZIL

Gerdau to modernize blast furnace

Gerdau and Danieli Corus have signed contracts covering the modernization of blast furnace No. 1 at the Ouro Branco integrated steel plant in Minas Gerais.

The projects will include a new furnace hearth, tuyere ring and bosh area, as well as a cooling system for the cast house runners. Using the input from earlier assessments and modelling of hearth erosion, a new hearth design based on large carbon blocks has been developed by Danieli Corus. This design is to achieve a lifetime in excess of 15 years. The cast house runners will be engineered to overcome thermal issues, improve accessibility between the main runner and taphole, and reduce the complexity of the back-up layers of the existing runners.



Gerdau plans a major upgrade of its blast furnace (Photo: Danieli Corus)

■ *Danieli Corus*

THE AMERICAS – BRAZIL

Eletrabras and SMS group explore potential of renewable hydrogen production

A partnership between SMS group and Eletrabras entails cooperation between the companies to assess the feasibility of renewable hydrogen production in Brazil, aiming to promote decarbonization in the steel industry's industrial processes.

Electric power company Eletrabras and Paul Wurth, a brand of the SMS group, have entered into a memorandum of understanding to collaborate in renewable hydrogen production and use in industrial

processes in Brazil. A 10 MW plant for green production of hydrogen and oxygen will be set up in the neighbourhood of a steel plant. The studies for installation are expected to conclude within one year.

"SMS group is committed to providing sustainable solutions on a global and national scale. The cooperation with Eletrabras represents a significant step in this direction. By combining Eletrabras' remarkable expertise in clean energy and extensive reach with our technological know-how, we are

not only advancing in the development of renewable hydrogen but also making its use more accessible," says Paulo Pinheiro, Managing Director of Paul Wurth Brasil.

The signing of this memorandum is the culmination of a project initiated two years ago, marked by the signing of a confidentiality agreement between Eletrabras and Paul Wurth.

■ *SMS group*

Petrobras and ArcelorMittal sign agreement on low-carbon business studies

Petrobras and ArcelorMittal Brasil have signed a memorandum of understanding with the purpose of studying potential mutually beneficial business models in the low-carbon economy.

The extensive cooperation stems from synergies identified in a joint study to develop a CCS (carbon capture and storage) hub in the state of Espírito Santo, as well as to evaluate business models that make its implementation economically viable. According to Jorge Oliveira, CEO of ArcelorMittal Flat Carbon Latin America, this initiative is in line with the group's global

goal of becoming carbon neutral by 2050. In the hub concept, CO₂ is captured from different locations and emission sources (steel industry, thermoelectric plants, cement industry, natural gas processing units, among others) and transported via a connected pipeline network, which can be shared and optimized for the storage of large quantities of CO₂ in suitable geological reservoirs.

This hub concept, with the use of connected networks, could boost technical and economic viability, favouring the use of CCS as a relevant large-scale decarbonization option.

Petrobras has already started mapping geological reservoirs that can be configured as safe and suitable carbon storage options and is also studying existing company facilities in Espírito Santo to integrate the CCS hub infrastructure for the state.

■ *ArcelorMittal*

THE AMERICAS – USA

Nucor to build new rebar micro mill in the Pacific Northwest

Nucor's board of directors has approved funding for a new rebar micro mill. The 650,000 t/year rebar micro mill in the Pacific Northwest will be Nucor's fourth and largest rebar micro mill.

Nucor continues to evaluate potential locations, and the project is expected to take

two years to construct, subject to regulatory approvals. "The rebar we produce at our Nucor micro mills is made from nearly 100 percent recycled scrap," said Leon Topalian, Chair, President and Chief Executive Officer of Nucor. "This new rebar micro mill in the Pacific Northwest will help Nucor further execute our strategy to better serve

our customers west of the Rocky Mountains, which also includes the addition of a melt shop at our Arizona bar mill." The new mill will produce a full range of rebar sizes and will have spooling capabilities.

■ *Nucor*

ASIA – CHINA

MaSteel produces 1,000-mm high-chromium steel blooms on new jumbo caster

MaSteel has been producing 1,000-mm-dia continuously cast blooms in high-chromium P91 grade steel on its new Danieli caster.

MaSteels's 18.5-m-radius jumbo round caster supplied by Danieli meets the increasing demand for special steels for the energy sector in terms of both production volumes and product quality. The four-strand caster is designed to cast up to

1,200-mm-dia. round blooms in medium-carbon steel grades. Each strand is equipped with fully automatic dummy bar top-feeding to reduce the restraining time and with three electromagnetic stirrers to guarantee high internal quality. The caster features proprietary dual temperature control, dynamic force control, dynamic extraction torque control and flexible secondary cooling, and operates with Danieli Automation process control systems.

Continuous casting of large-diameter blooms in P91 grades is challenging because this high-alloy chromium and molybdenum steel is designed to maintain mechanical resistance at high temperatures, and is hence hard to unbend.

| Danieli

Anshan Iron and Steel orders new reversing cold mill

Primetals Technologies has been selected by Anshan Iron and Steel Group to supply a reversing cold mill for the steel plant in Anshan City, Liaoning province.

The new 20-high HZ-mill will produce high-strength silicon steel for the electrical steel market. The HZ-mill, an advanced

split-housing ZR-mill from Primetals Technologies, is designed with a large gap opening, which results in easy strip threading and a smooth recovery after strip breakages.

The roll-diameter configuration is tailored to individual needs. The HZ-mill lets operators utilize almost the entire range of

the work rolls, regardless of the diameter of the intermediate rolls, resulting in more options than achievable with the monoblock ZR-mill.

| Primetals Technologies

Shougang starts electrical steel production on new annealing and pickling line

Shougang has started to produce high-grade, non-grain oriented (NGO) electrical steel on its new annealing and pickling line. The annealing furnace for

the line was designed and supplied by Fives.

Shougang's new line required thermal technology that would be able to match

the high line capacity of 650,000 t/year. The furnace solution supplied by Fives includes dedicated models specifically designed for the metallurgical control of electrical steel, enhanced oxygen control for high product quality, high-temperature technology combined with heat recovery and emission reduction systems.

Engineering and manufacturing of the main equipment were provided from China, while the burners, automation and process instrumentation were delivered from France.

In 2023, Shougang ordered two more furnaces from Fives for new annealing and coating lines to be used to produce electrical steel for the electric vehicle market.

| Fives



Annealing and pickling line for electrical steel production. (Photo: Fives)

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ASIA – INDIA

ArcelorMittal Nippon Steel India publishes climate action report

ArcelorMittal Nippon Steel India (AM/NS India) has published its first climate action report, outlining immediate actions to accelerate and decarbonize India's development.

AM/NS India – a joint venture between ArcelorMittal and Nippon Steel – targets a reduction in emissions intensity by 20% by 2030 with a roadmap of actions across the entire value chain of steel production: Bolstering renewable energy to meet 100% of grid electricity needs; increasing the recycling of scrap steel over twofold through new and enhanced sourcing and processing facilities; and driving operational efficiencies with new technology improvements.

The report also sets out a series of strategic investments, pilots and partnerships to accelerate the uptake of breakthrough technologies necessary to produce net zero steel in India, such as green hydrogen and carbon capture, utilization and storage (CCUS). The report sets out recommendations for enabling policies that can unlock industry-wide progress including tax incentives, new norms for FDI, a green grid and more.

| ArcelorMittal Nippon Steel India (AM/NS India)

ArcelorMittal Nippon Steel India to build new water-treatment plant

ArcelorMittal Nippon Steel India (AM/NS India) has placed an order with Danieli for the supply of a new water-treatment plant for its facilities in Hazira.

The new water-treatment plant will serve a 5.5 million t/year hot-strip mill. It will be designed for a total cooling-water flow rate of around 60,000 m³/h. Danieli will use its patented DanFilters™, which ensure deep-water filtration at high processing rates. For this project, Danieli developed a customized design to optimize space utilization of the available footprint. The plant will operate with a Danieli Automation control system. Design, manufacturing and commissioning will be performed entirely by Danieli India.

| Danieli



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ASIA – INDIA

Tata Steel to build new combined pickling and galvanizing line

Tata Steel has contracted Danieli for the supply of a new combined pickling and galvanizing line for hot-rolled coated products to be installed at its Cold Rolling Complex West in Tarapur.

With this investment, Tata Steel will diversify the portfolio of hot-rolled galvanized products supplied out of its Tarapur facilities. The pickling section of the new 700,000 t/year line will be based on Danieli patented Turboflo® technology. Danieli Centro Combustion will provide the ver-

tical heat-to-coat furnace equipped with low-NO_x burners, high-efficiency jet coolers and after-pot coolers to process the hot-rolled strip. The latest-generation compact X-Jet gas-wiping system will ensure the best coating uniformity and metal coating-thickness control.

A level-1 integrated robotic system will ensure precise and safe skimming of the zinc bath surface, dross removal and collection into a dedicated container to minimize zinc use. The strip finishing and levelling facilities will guarantee strip

roughness and flatness of up to 5IU. A turret-type side trimmer with scrap chopper will guarantee compliance with specified strip width tolerances. Danieli Automation electrical and automation systems will guarantee full process control with minimum manual interventions. Line commissioning is planned for early 2026.

| Danieli

SAIL signs MoU on green steel transition at Rourkela plant

Steel Authority of India Limited (SAIL) and Primetals Technologies have signed a memorandum of understanding to closely collaborate on projects and technologies related to decarbonization at its Rourkela plant in Odisha.

The partnership with Primetals Technologies is a key strategic move in SAIL's endeavour to lower its carbon footprint. Primetals Technologies will work closely with SAIL's Rourkela location, providing expertise across the green ironmaking and

steelmaking value chain, including but not limited to carbon capture and utilization (CCU), digitalization, hydrogen-based steel production, electric steelmaking, and advanced gas-cleaning solutions.

The Rourkela facility has an annual crude steel capacity of 4.2 million t. The plant's product portfolio is wide-ranging and comprises prime plates, hot rolled coils, cold rolled coils and sheets, galvanized sheets, cold rolled nonoriented (CRNO) electrical steel, electric resistance welded (ERW) pipes, spiral welded pipes, and special plates. Sharad Raghunath Suryawanshi, Executive Director (Works) of SAIL's Rourkela steel plant, commenting the MoU: "The SAIL Rourkela steel plant is happy to get associated with Primetals Technologies on our endeavor to cut down the carbon emissions in order to meet our overall target of becoming net-carbon neutral."

| Primetals Technologies



Representatives of SAIL and Primetals Technologies during the contract signing ceremony at the SAIL Rourkela steel plant in Odisha (Photo: Primetals Technologies)

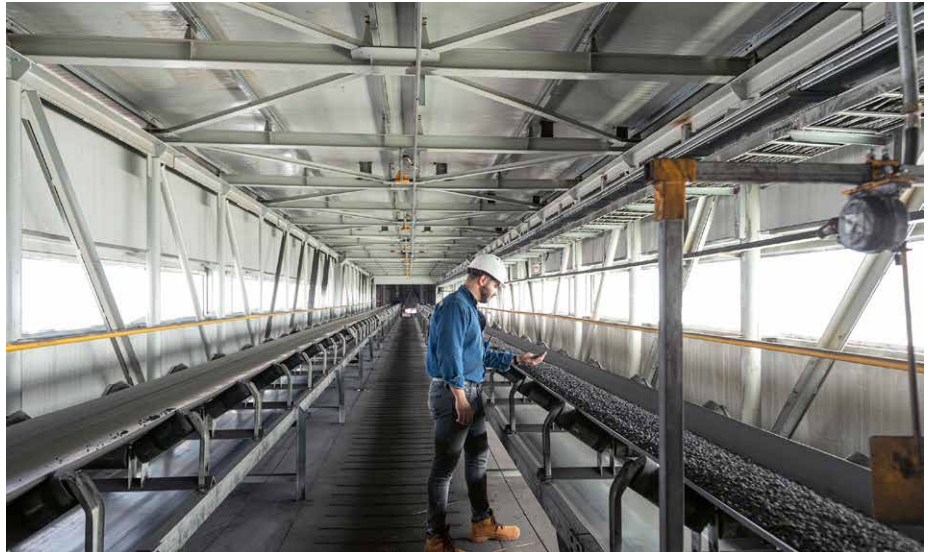
ASIA – JAPAN

Nippon Steel to operate experimental hydrogen DRI plant

Nippon Steel Corporation will use Ener-Iron® direct reduction technology, jointly developed by Tenova and Danieli, to conduct experimental operation with hydrogen-reduced iron.

Tenova has been awarded a contract for an experimental direct reduction plant operated by Nippon Steel Corporation at the Hasaki R&D Center. This project is being undertaken by a consortium formed by Nippon Steel Corporation, JFE Steel Corporation and the Japan Research and Development Center for Metals.

The DR plant will use hydrogen as reducing gas, while retaining the flexibility to use different gases in any combination or proportion. To this end, the plant will be equipped with Tenova CO₂ capture equipment that allows to curb overall CO₂ emissions when the plant operates with mixes of gases containing carbon.



DRI being discharged from the direct reduction plant (Photo: Tenova)

■ Tenova

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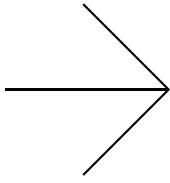


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CHAIRMAN OF THE BOARD OF DIRECTORS

R&D FOCUS ON THE CLIMATE-FRIENDLY PROCESS ROUTE

Construction of test facilities for DRI and hot metal at thyssenkrupp Steel

Germany's largest steel company is setting up test facilities for direct reduction and smelting technologies to promote research into electric hot metal from hydrogen-based direct reduction

Thyssenkrupp Steel produces about 11 million metric tons of crude steel per year – making it Germany's largest flat steel manufacturer. To help combat climate change, the company has set itself the goal of reducing its CO₂ emissions by more than 30% annually as early as 2030. By 2045 at the latest, the steel production is planned to be completely carbon-neutral.

Thanks to funding from the national and regional governments for thyssen-

krupp Steel's tkH₂Steel® project at the Duisburg site, the transformation is becoming reality: the production of premium steel with green electricity and hydrogen-based direct reduction technology. In terms of climate-friendly steel-making technologies, thyssenkrupp Steel will gradually implement a process scheme with hydrogen-based direct reduction plants and innovative melting units to supply the existing BOF plants with hot metal.

In March 2024, the company signed contracts for the construction of test facilities to carry out trials of the direct reduction process and the smelting process, respectively. "Hydrogen-based direct reduction in combination with melters is an innovative approach that thyssenkrupp Steel is implementing on a large industrial scale for the first time. That's why it is essential to apply and learn about the new technologies in practice on the way there," says Chief Technology Officer



Representatives of the partners in the Melter Test Facility project: BfI, thyssenkrupp Steel and Grenzebach Maschinenbau (Photo: thyssenkrupp)

Dr. Arnd Köfler. “The experimental melter and the direct reduction test facility are the heart of our research into carbon-neutral steel production of the future. They will enable us to use different charge materials flexibly, and to find precise answers to the fundamental technological questions surrounding the transformation of steelmaking.”

Direct reduction test facility

The German plant supplier TS Elinor will build the direct reduction test facility, including the associated auxiliary units, at thyssenkrupp Steel's Duisburg-Nord site. The planned facility will be about 40 meters in height and will be able to reproduce various direct reduction processes. As a result, it will offer maximum flexibility for research into direct reduction. Equipped with the most innovative measurement, control and regulation technology, the facility will make it possible to use various reduction gases such as hydrogen, natural gas and the mixed gases produced during steelmaking. Since it is not tied to a specific direct reduction process, it will be possible to operate the facility in a technology-open manner with different feedstocks such as pellets, lump ore and recycled materials. The test facility will have a capacity of 100 kg/h of directly reduced iron and will be connected to the media and infrastructure of the nearby Carbon2Chem Technical Center.

The VDEh Institute for Applied Research (BFI) is coordinating the project and will be responsible for operating the test facility; the first test campaigns are planned for early 2026. In this way, it will be possible to optimize future operating points and simulate the integration of the facility into the process network of an iron and steel works before the plant currently under construction is commissioned on an industrial scale. In addition to CO₂ savings, product quality and plant performance, the research also aims to gain insights into plant handling and safety. The tests will be accompanied by simulations and special investigations into reduction plants at the Technical Center of the VDEh Institute for Applied Research (BFI) in Düsseldorf. These will enable research at various scales (technical center facility, direct reduction test facility, industrial plant). The test facility will make an important contri-

The experimental melter and the direct reduction test facility are the heart of our research into carbon-neutral steel production of the future.

Dr. Arnd Köfler, Chief Technology Officer at thyssenkrupp Steel

bution to the industrial implementation of hydrogen-based direct reduction.

The order volume for the direct reduction plant on a demonstration scale is worth around 10 million euros, and forms part of the “energy transition real-world laboratories” H₂Stahl project funded by the German Federal Ministry for Economic Affairs and Climate Protection (BMWK).

Melter test facility

thyssenkrupp Steel has commissioned German machine building company Grenzebach Maschinenbau GmbH with the engineering, construction, and commissioning of a DRI melter test facility, including the associated auxiliary units, at the Duisburg site. The project, led by the VDEh Institute for Applied Research (BFI), aims to show how sponge iron from direct reduction plants can be liquefied in an innovative melter and then processed further into hot metal. The contract is worth around 7.5 million euros, with Ministry of Economic Affairs, Industry, Climate Action and Energy of the State of North Rhine-Westphalia covering 65% and thyssenkrupp Steel 35% of the total cost of the project.

The demonstration-scale melter with a capacity of 100 kg/h of directly reduced iron is adapted to the DRI test facility. The first trial campaigns to test different feedstocks such as direct reduced iron (DRI), alternative carbonaceous products and recycled materials for hot metal production are scheduled to start at the beginning of 2026.

In addition to investigations into CO₂ reduction and the quality of the hot metal produced, a further objective of the project

is to condition the slag from the melter so that it can be used as a basic material for cement production, comparable to the current use of blast furnace slag in conventional hot metal production. The cement industry is a difficult one to decarbonize, but this concept will also enable the CO₂ emissions from the industry to be sustainably reduced.

Outlook

With the new test facilities, thyssenkrupp Steel is closing the gap in pilot trialing of the entire production process from raw material to rolled steel strip. The process steps from steel production, from rolling through to surface refinement are already being simulated on a reduced scale in pilot plants. With this approach, new technologies and concepts can thus be tested realistically, with a focus on customer needs.

Pilot-plant-scale development not only conserves resources and reduces development costs, it also prevents disruptions in operational production facilities. The demonstration scale therefore also makes it possible to learn from mistakes and adjust the parameters and operating points.

It is also planned for new input materials to be trialed. This will make it possible to identify optimized solutions along the production route and then, once the large direct reduction plant being built in Duisburg is commissioned, integrate them seamlessly into the existing iron and steel plant.

■ *thyssenkrupp steel*



Pelletising plant at Tata Steel's IJmuiden works (Picture from the archives © Tata Steel Europe)

Global market trends for direct reduction iron ore pellets

The “Global Iron Ore DR Pellets Market (2023 Edition) – Market Insights and Forecast 2023-2029” report has been released by international analyst agency Research and Markets

According to the actual analysis of Research and Markets the global iron ore DR pellets market showcased growth at a CAGR of 6.26% during 2019-2022. The market was valued at USD 7.62 billion in 2022 which is expected to reach USD 21.1 billion in 2029.

Stricter laws and an increasing commitment to sustainability are a result of growing worries about climate change and its effects on the environment. Because they provide a more ecologically friendly alternative to conventional blast furnace processes, which generate more emissions, DR pellets are preferred in the manufacturing of steel. Moreover, direct reduction (DR) technology enables the substitution of coke, a common reducing agent in blast furnaces, with natural gas or hydrogen as reducing agents.

The global iron ore DR pellets market is expected to grow in the forecast period and register a CAGR of 16.33% during the forecast period. The global demand for steel has been increasing, primarily driven

by infrastructure development, construction projects, and industrialization in emerging economies. Iron ore DR pellets are a key raw material for steel manufacturing through the direct reduction process, making them in high demand. Moreover, in comparison to conventional iron ore material, using iron ore DR pellets in the direct reduction process may be more cost-effective. In order to improve the quality of the iron ore DR pellets and to increase the efficiency of the production process, R&D and also machine learning models are being applied to the DR pellets.

As a result, there is a greater need for iron ore pellets used in the direct reduction process. Producers of DR pellets will experience heightened demand, leading to higher production volumes. Steel manufacturers, using the direct reduction method, increase their utilization rates to meet the soaring steel demand. This necessitates a proportional surge in the production of DR pellets. Existing pellet producers strive to maximize their output, operating at or near full capacity to capitalize on the favourable market conditions.

High demand encourages the exploration of new markets and the expansion of existing ones. Pellet producers seek to

establish long-term relationships with steel manufacturers, securing contracts for the supply of DR pellets. Market development efforts may also involve geographical expansion, targeting regions with emerging steel industries or those experiencing infrastructure development.

The research report covers a detailed analysis of the regions (Americas, Europe, APAC, Middle East Africa) and 10 countries (United States, Canada, Brazil, Mexico, Germany, Russia, United Kingdom, China, Japan and India). Additionally, the research report presents data including market size, yearly growth and potential analysis, the competitive study of market players, investment opportunities and demand forecast. The research report also assesses growth indicators, restraints, supply and demand risk, and other important statistics, as well as a full assessment of current and future market trends that are relevant to the market evolution.

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TRANSFORMING STEEL RESEARCH

Finland's steel sector to develop fossil-free steel skills

Towards Fossil-Free Steel Phase 2 (FFS 2) is a joint project that brings together industry and research institutes in Finland to jointly develop their skills and business in fossil-free steelmaking



Raabe integrated steelworks with computerised image (dark grey) of future mini-mill
(Picture: SSAB)

The transformation to fossil free steel-making requires a new approach to and research into the entire steel production process. The transformation to fossil-free steelmaking will have a wide-reaching impact on the technologies involved: the melting and rolling processes, side streams and, importantly, the generation and use of electrical power. The research project will also focus on resolving unanswered questions related to the details of among other things the mini-mill-type production process.

“Although the principle of fossil-free steel production is well known, there are still many challenges to be overcome by 2030. The FFS project, which ended at the end of 2023, was successful and generated a lot of new information on fossil-free steelmaking technologies, energy issues and sustainability. The project was originally planned as a 2+2-year project, and we have now launched the second phase

with a new consortium,” says Jarmo Lilja, Process Development Manager at SSAB.

The planned new production system based on mini-mill technology in Raabe means SSAB has specified the research focus areas as thin-slab casting and direct rolling technology, electric melting of recycled scrap steel and hydrogen-reduced sponge iron in electric arc furnaces, and

recycling and utilization of secondary materials. The completed FFS project resulted in new opportunities being found, for example, in the use of biochar (a form of charcoal) for slag foaming in electric arc furnaces.

The FFS2 consortium comprises ten companies and three research institutions – the University of Oulu, VTT Technical Research Centre of Finland and Åbo Akademi University. The project is being funded by Business Finland and coordinated by environmental consultant Macon Oy.

“The new project will enable us to go deeper into the critical manufacturing stages of hydrogen-based steelmaking using our own unique pilot facilities together with top international researchers in Germany, Austria, Sweden and Canada,” says Timo Fabritius, Professor in Process Metallurgy at the University of Oulu, Finland.

The steel industry has a major impact on the Finnish economy and directly or indirectly employs around 27,000 people in Finland. The steel industry is also the largest carbon dioxide emitter, accounting for around 7% of Finland's total emissions. The FFS2 project is very important with regard to strengthening the competitiveness of the steel industry while reducing carbon dioxide emissions.

SSAB

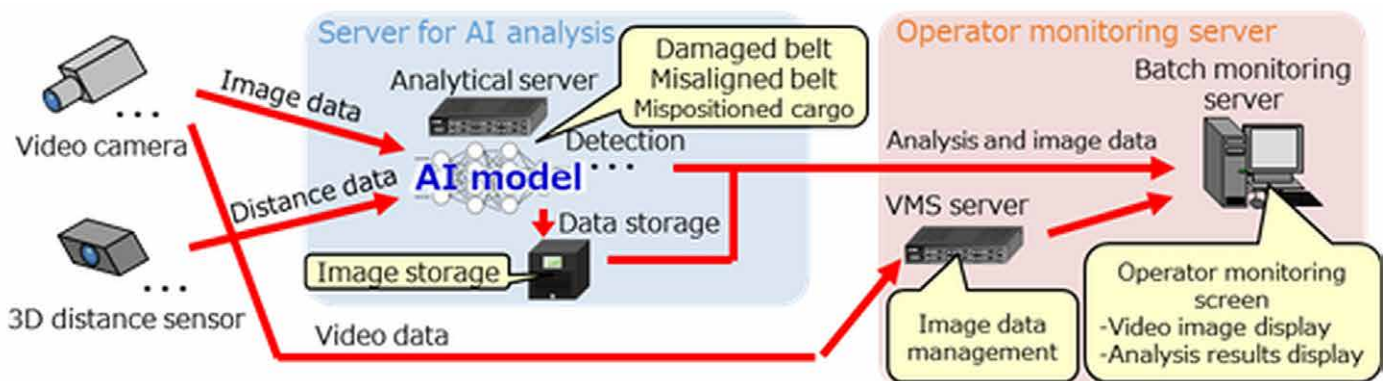
Although the principle of fossil-free steel production is well known, there are still many challenges to be overcome by 2030.

Jarmo Lilja, Process Development Manager at SSAB

PLANT MAINTENANCE

Smart belt-conveyor monitoring system to improve productivity in raw material yards

JFE Steel Corporation, a leading steel manufacturer in Japan, has developed a system that uses advanced data-science technology to automatically monitor raw-material belt conveyors for potential problems, aiming to achieve more stable operations and improved productivity at its steelmaking sites in Japan.



Automated belt-conveyor monitoring system (Picture: JFE Steel)

Raw material yards are where iron ore, coal and other raw materials for steel-making are unloaded, stored and transported. Multiple conveyors are installed across these large yards to transport raw materials directly to upstream processes. Problems with such systems, however, can have a major impact on operations, which is why belt conveyors must be monitored constantly.

JFE Steel’s new monitoring system uses AI image-recognition and other data

science technologies to automatically detect damage to conveyor belts by examining images captured with video cameras installed on the conveyor equipment. Notably, the system enables continuous monitoring of all belts in a yard, which can total up to two kilometres in length.

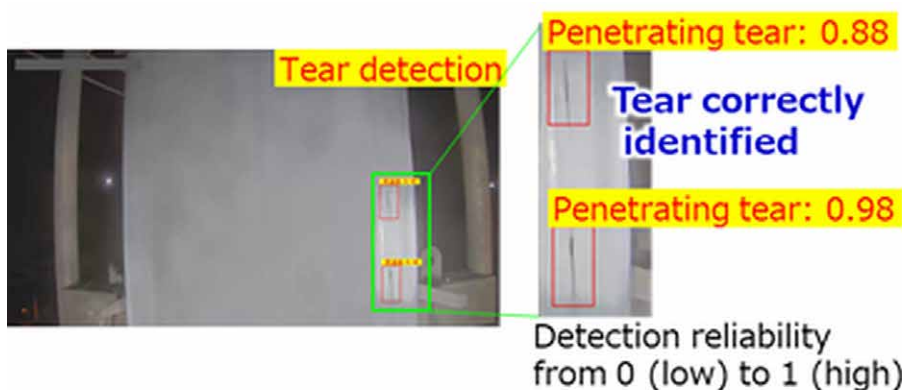
The same video images can also be used to confirm if a belt edge ever becomes misaligned. In addition, 3D sensors monitor the status of payloads to

ensure they remain properly positioned on the conveyor belts.

A video management system (VMS) contributes to labor savings by allowing operators in a control room to confirm analysis results at a glance.

The smart belt-conveyor monitoring system has been installed at the raw material yards of JFE Steels’ East Japan Works (Chiba District) and West Japan Works (Kurashiki District), with plans to roll out the system to all yards in the company’s domestic network.

JFE Steel is steadily raising its operational productivity and stability through digital transformation (DX) initiatives, including the establishment of the JFE Digital Transformation Center (JDXC®) and the construction of cyber-physical systems at steelworks and other facilities. The company is committed to utilizing innovative DX to realize more sustainable manufacturing.



Example of damaged belt detection (Picture: JFE Steel)

■ JFE Steel Corporation



© thyssenkrupp Steel Europe AG

Aumund conveyor technology (in red) will connect the DRI plant with the melters (Picture: thyssenkrupp Steel Europe AG)

HOT DRI TRANSPORT

Conveyor technology for the tkH₂Steel® project in Duisburg, Germany

Two bucket apron conveyors for the transport of hot DRI will be supplied by Aumund Fördertechnik to the new thyssenkrupp Steel direct reduction plant in Duisburg, Germany. In the future hydrogen-based “green steel” production process, the two hot material conveyors will be the direct connection between the direct reduction plant and the melting furnace. Delivery of the steel plant with the Aumund conveyors is scheduled for autumn 2024.

Both conveyors will be installed under the shaft furnace of the direct reduction facility, and their function is to feed the melting furnace directly with hot DRI. The direct reduction shaft furnace designed by Midrex Technologies, USA, is the core technology of the plant. “The order from thyssenkrupp Steel is not only a very important project for us, but will also

play a leading role in the transformation of green steel in Germany,” says Matthias Moritz, Sales Director Metallurgy at Aumund Fördertechnik. He continues, “Thanks to a large extent to the success of our joint projects with Midrex, we are very proud of our proven experience in conveying technology for direct reduction plants.”

Functionality of the conveyors. Aumund’s patented hot material conveyors are a closed system for continuous material feed. They transport the DRI in an inert atmosphere that prevents it from coming into contact with the air, thus avoiding re-oxidation.

One of the advantages of this closed mechanical system is that it uses much

less energy than pneumatic conveying. Unlike pneumatic conveying, there is no relative movement between the equipment and the material being conveyed along the conveying path. This prevents additional fines from being generated during transport.

Aumund equipment is automated. Sensors monitor the temperature and condition of the material on the conveyor. The concept of the transport system is that the inert gas protects the material from contact with the outside air and the dust remains inside the system.

Flexibly constructed. This conveyor system, which has been successfully used for over 20 years, is adapted to the required capacities and the situation at the installa-

tion site. Temperatures of up to 1,000°C and inclinations of up to 60 degrees are among the design features. The largest lifting height achieved so far with a bucket apron conveyor for hot direct reduced iron is 110 m and the maximum conveying capacity is 480 t/h. "Lifting height and conveyor capacity are correlated characteristics and are limited by the strength of the chains," says Frank Reddemann, Senior Manager in the Metallurgy Division. He continues: "Our chains have tensile strengths of up to 3,000 kN per chain. Aumund develops the chains for the conveying systems itself".

Experience in plants all over the world. The patented Aumund conveyor technology has been proven in more

than 700 plants in the iron and steel industry worldwide. For example, the first hydrogen-based plant of the Swedish company H2 Green Steel will be equipped with this Aumund technology and will produce green steel from 2025. In addition to the hot material conveyor, the plant will also have two cooling conveyors, which have a low water consumption. The little water they use can even be returned to the cycle. The waste heat can also be recovered and reused. All Aumund equipment already operates according to the ideas of green steel production: less pollutants, conservation of resources and reuse.

■ *Aumund Group*

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ADVANCED AUTOMATION SENSOR

Radar-based molten metal level measurement technology

A rugged radar sensor measures the level of molten metal with high accuracy and sampling rate. Linked to automation systems, the radar solution enables increased productivity and safety.



Schematic of radar level measurement in a crucible (Picture: OndoSense)



Apex radar sensor suitable for high-precision, reliable level measurements, distance, and dimension measurements (Picture: OndoSense)

OndoSense is expanding its portfolio in the metal industry: The German radar specialist has developed a sensor solution for the level measurement of molten metal with unprecedented precision and stability. The robust and low-maintenance radar system reliably measures the level of steel, aluminium, or copper at temperatures up to 1,600°C, even in the presence of dust, fumes, smoke, vibrations or sparks. The sensor usually does not need to be actively cooled, which makes commissioning significantly easier.

The solution is based on the apex radar sensor from OndoSense and features a measurement accuracy of up to 300 µm, a measurement rate of 300 Hz and a measurement range of 0.1 to 15 meters. According to OndoSense this is the most accurate and fastest radar sensor for the level measurement of liquid metal. This radar solution not only contributes to increasing productivity and reducing costs, but also makes it possible to automate safety-relevant processes that can pose a risk to operators. In addition, it contributes to lowering CO₂ emissions in the metal processing industry.

Minimal maintenance, easy commissioning

Enhanced performance and increased productivity are not the only advantages of the radar system. For instance, the minimal maintenance effort required for radar technology ensures maximum availability: "Radar has no moving parts or sensitive optics. As a result, the longevity of the sensors is very high. In addition, the radar sensor measures faultlessly even when the lens is dirty and only needs to be cleaned very rarely. Temperature fluctuations, metal splashes or reflections have



An optional heavy-duty housing that protects the sensor electronics against extreme heat – with and without ceramic protective plate
(Picture: OndoSense)

no influence on the level measurement. Our radar sensor technology is easy to integrate and to place into operation. This guarantees an uncomplicated, reliable and highly productive level measurement,” says Mathias Klenner, OndoSense Co-CEO and founder.

The sensor solution for molten metal level measurement based on the OndoSense apex radar sensor is suitable for crucibles, ladles and troughs as well as for furnaces or casting molds. Generally, active cooling of the level radar is not necessary: “A protective window made of ceramic usually offers sufficient heat protection without affecting the high accuracy and quality of the measurements. For special cases, we have developed an optional heavy-duty housing to shield the sensor electronics against extreme heat,” says Mathias Klenner.

In addition to measuring the level of liquid metal, the range of applications for the sensor includes, among other things, the width and thickness measurement of semi-finished metal products in the rolling mill, the positioning of deslagging machines in batch furnaces and the position control of the steel strip for coating lines or picking system. The OndoSense apex is also suitable for other industries and application areas with adverse production environments – e. g. the mining industry, mechanical and plant engineering or the energy sector.

Heavy-duty housing to protect against extreme heat

Whether dirt, smoke, steam, heat or adverse lighting conditions: the radar sensor solution offers a measurement accu-

racy of 300 µm in addition to the high measurement precision of up to 1 µm, even in the extreme conditions of the metal and steel industry. For applications with extreme heat generation, the radar solution features a heavy-duty housing to shield the sensor electronics, if required. The solid stainless-steel housing not only ensures passive heat dissipation: If necessary, the radar sensor can also be actively cooled using appropriate connections. The heavy-duty housing has a window that is covered with a heat-resistant ceramic pane. This pane is transparent to radar radiation, so that the radar sensor can be safely placed behind the window. This set-up does not affect the high reliability and accuracy of the measurement.

■ *OndoSense GmbH, Freiburg, Germany*

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RESULTS FROM 5 YEARS OF OPERATION

Consistent production of high-quality special steel slabs at voestalpine Stahl

Austria's leading steel producer has achieved significant productivity gains with the CC8 slab caster supplied by Danieli. After 5 million tons of slabs produced on this line, remarkable results have been achieved in terms of quality, technology and productivity.



After starting up with the first slab on 18 January 2018, the CC8 slab caster at voestalpine Linz ramped up production in record time and has proven to consistently deliver excellent product quality for more than five years (Picture: Danieli)

In 2015 Austrian steel company voestalpine decided to invest in a new benchmark slab caster to replace the existing CC3 caster, which was reaching its life operation limits. Danieli was chosen as technology supplier for the first time for slab casters at the Linz works, because of the whole of the technological packages which could guarantee the competitive production of crack-sensitive steel grades, predominantly for automotive and electrical applications.

Since the start-up in January 2018, the CC8 caster of voestalpine in operation in Linz, Austria, has been producing top-quality slabs for automotive and exposed parts, and by the end of March 2023 (closure of voestalpine business year), CC8 caster reached the target of 5 million tons of top-quality slabs produced. This goal was achieved thanks to a perfect combination of the high competence of voestalpine's Operating & Maintenance Team and the Technical and Technological Team of

Danieli who, working together, further improved the functions of the CC8 slab caster. Following the steep ramp-up of the caster, which allowed it to exceed the nominal capacity of the plant after only 10 months of production, the cooperation between the teams allowed them to continuously improve the equipment reliability as well as plant availability, and consequently the yearly production.

During the last 12 months, voestalpine CC8 slab caster produced 225-mm thick

Paolo Franco, Vice President Slab Caster Execution, Danieli Centro Met, Buttrio, Udine/Italy; Herbert Moser, Vice President Continuous Casting, Head of Casting Operations, voestalpine Stahl, Linz/Austria

slabs in widths ranging between 800 and 1,820 mm. During the period March 2022 - March 2023, the production breakdown comprised the following mix:

- > Structural steels: 39.5%
- > Ultra-low-carbon steels: 29.1%
- > Silicon electrical steels: 25.4%
- > Low-carbon steels: 5.7%
- > Other steel grades: 0.3%

Thanks to the robust design of the equipment, the applied technical solutions and to voestalpine operation and maintenance-oriented mentality, the rolls of the horizontal segment were able to exceed 4 million tons of production within the same campaign life.

Technological packages

A fundamental contribution to the high-quality achievements has been given by the Danieli-Rotelec MM-EMS® **Mould Multi-Mode Electro-Magnetic Stirrers**. Thanks to its three functions – acceleration, braking, and rotation – MM-EMS® allows voestalpine to constantly achieve the optimum quality by automatically addressing mould fluid dynamics in all casting conditions of ultra-low-carbon steels for automotive exposed applications.

Following the achieved results, in line with voestalpine’s vision, and development plan with Danieli, voestalpine is currently expanding the use of MM-EMS® to the production of peritectic and silicon steel grades. The aim of this fine-tuning of MM-EMS® for peritectic steel is to enhance the uniformity of the initial solidification shell by optimizing steel flow and heat distribution to the meniscus, reducing crack formation.

For silicon steel, there is a growing demand for very thin laminated electrical sheets with minimal inclusions in slabs, for emerging advanced applications. As a result, optimizing steel flow in the mould becomes essential to ensure the best quality for these added-value products.

The CC8 caster is equipped with the most advanced technological packages and includes:

- > Q-WIDTH: change of the width during casting
- > Q-MAP: complete thermal map
- > Q-LEVEL+: automatic mold level control system
- > Q-ROLL: slab casting roll technology
- > Q-ROBOT: sampling, temperature measurement, and lancing

From the production point of view there is already a high level of confidence in the caster, and this is giving us flexibility on the production plan and reliability on performance and quality.

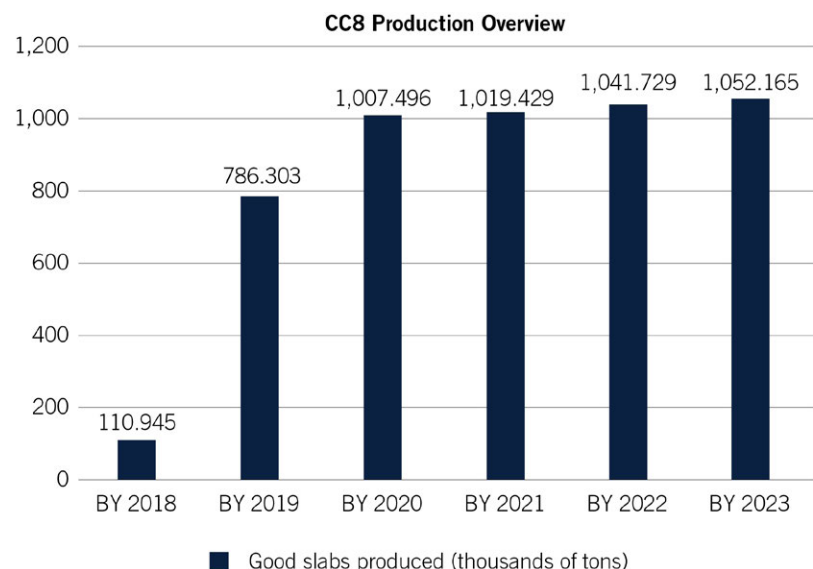
Peter Hodnik, CC8 Operation Manager at voestalpine Stahl

Among the above packages, the slab width change system Q-WIDTH plays a fundamental role, providing voestalpine the flexibility required to ensure a three-day timeframe from order to delivery. voestalpine CC8 caster performed **more than 41,600 slab width changes** since its startup, with an average of more than 8,800 slab width changes per year in the last four years, demonstrating the robustness and reliability of the Q-Width system.

Q-WIDTH is an exclusive Danieli, combined mechanical and software system allowing for slab-width changes without interrupting caster production. It performs automatic, online adjustment of the narrow side position and taper, without restricting or reducing the casting speed required for productivity.

Slab width can be automatically increased or decreased to guarantee maximum operational flexibility, in line with voestalpine requirements and production schedule. Furthermore, the narrow side taper can be continuously adjusted according to the slab width, casting speed, steel chemistry, and superheat.

Any movement of the narrow-side mould plates is generated by an electro-mechanical system consisting of motor and roller screw jacks that are controlled in position by a linear transducer, mounted inside the screw jack rod, directly connected, without backlash to the narrow side. This arrangement is a key technological point that guarantees the system will not be affected by any mechanical backlash.



Production figures of the CC8 slab caster since start-up (Picture: Danieli)

Evolution of the Multi-Mode EMS

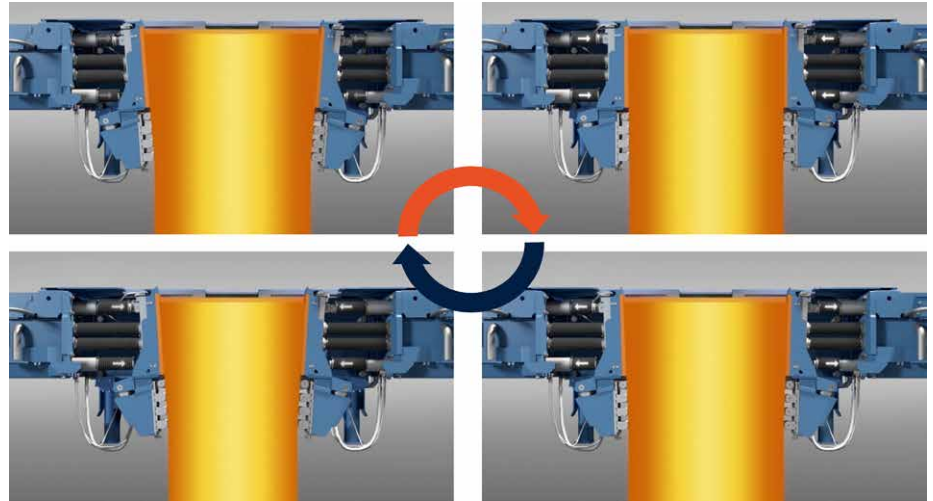
The good and profitable cooperation between voestalpine and Danieli teams will continue in the future, as an important common project to further improve the tuning of the Mold Multi-Mode Electro Magnetic Stirrer (MM-EMS) is nearly ready to start.

As is well known from many years of experiments on continuous slab casters, an optimal steel flow pattern in the mold is the starting point for achieving the best surface and sub-surface product quality, reducing defects from inclusions and mold-powder entrapment to the lowest level. MM-EMS provides intelligent control of three functions for slowing down, accelerating and rotating the liquid steel in the mould to reduce the steelmaking defects.

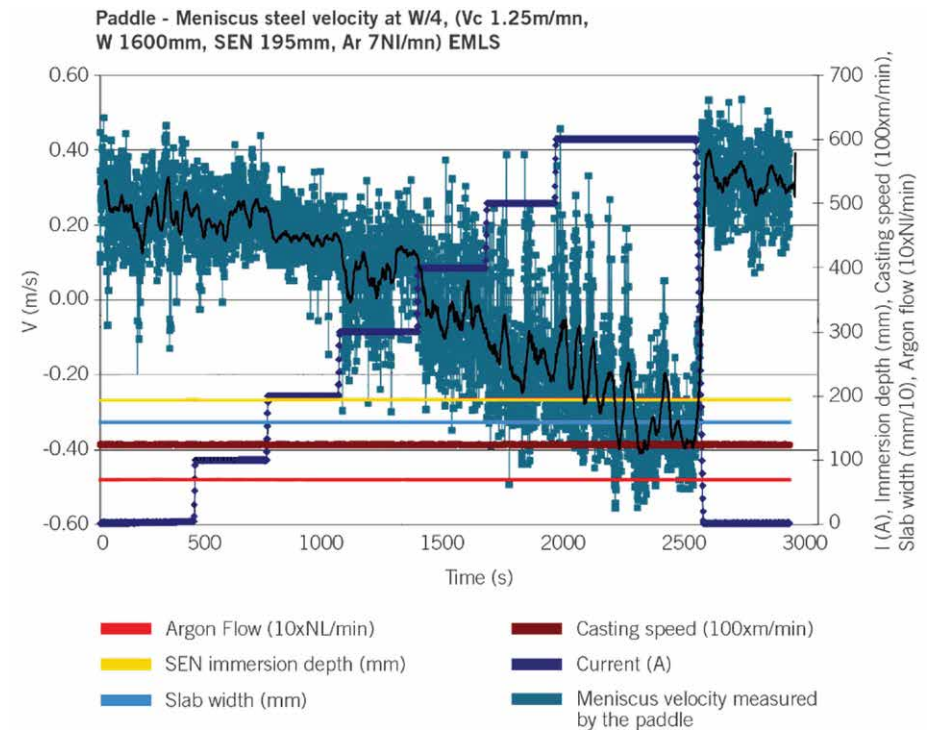
To determine the natural flow associated with different casting conditions of casting speed, slab width, SEN immersion depth and argon flow, different methodologies and models have been developed, including CFD simulations and real-scale water modeling. However, on continuous casters, nailboards and paddle methods are used to capture the steel flow direction and intensity at the meniscus.

According to these measurements the proper control functions, like slowing down, accelerating or stirring, are applied by the Multi-Mode Electromagnetic Stirrer at the correct intensity. The system controls automatically the steel flow inside the mold to maintain as much as possible the optimal steel flow with the appropriate magnetic forces generated by the stirrers in all the different casting conditions.

The general procedure for MM-EMS automatic control can be summarized as follows: A meniscus steel velocity is issued according to the casting conditions, the nailboards mapping and four parameters (casting speed, slab width, SEN immersion depth and argon flow). Then, from this velocity and through the master files, the stirring function and the current intensity are calculated and applied.



Q-WIDTH plays a fundamental role in providing a very high degree of production flexibility (Picture: Danieli)



Paddle measurement with EMLS, slowing down function (Picture: voestalpine)

Based on first quality results, the adoption of the MM-EMS shows an improvement in the quality results in terms of sliver occurrences. At present, Multi-Mode tests are still on-going on the CC8 caster in collaboration with voestalpine stahl and the quality data are collect-

ed from the downstream process lines to consolidate the results and fine-tune the process further.

voestalpine / Danieli

WIRE ROD PRODUCTION

Record-setting startup of the modernized wire rod mill at Kaptan Demir Çelik

After a successful modernization of the wire rod mill the Turkish steel company Kaptan has expanded its portfolio to include such value-added products as coiled rebar, fine grain rebar, and welding wire for the engineering and automotive industries. The new equipment allows Kaptan to be a quality leader on the market.

The startup was remarkably quick. It took only 21 days from start of hot commissioning until the first saleable product. This record-setting implementation has established a new industry standard and was made possible thanks to an experienced project team as well as close and effective collaboration between Primetals Technologies and Kaptan.

With an annual capacity of 650,000 tons, the modernized wire rod mill will process carbon, austenitic stainless steel, and cold heading grades. The equipment's technological advantages, along with prominent aftermarket services, were two of the main influencing factors when Kaptan chose Primetals Technologies as supplier in 2021.



10-stand next-generation Morgan No-Twist mill (Picture: Primetals Technologies.)

High quality at lower energy costs

The new wire rod outlet has increased Kaptan's overall production and finishing speeds. The mill rolls up to 105 tons per hour at speeds of up to 110 meters per second. Kaptan can now offer quality carbon products ranging from 4.5 to 26 millimetres in diameter at an expanded range of rebar sizes from 6 to 20 millimetres.

Kaptan's new mill has the distinction of being the first to combine a Morgan Rod Reducing/Sizing Mill (RSM) with a next-generation No-Twist Mill (NTM) consisting of individually driven stands. This configuration allows Kaptan to consistently deliver high-quality finished products at reduced alloying and energy costs. The RSM can also achieve the tight tolerances required for the high-carbon tire cord market. Additional production advantages result from a metallurgical in-line heat treatment process using high-precision Morgan Water Boxes and Morgan Stelmor Controlled Cooling Conveyor.

Streamlined operations

Primetals Technologies' electrical and automation supply included the main and auxiliary drives and motors, new Level 1 automation system with human-machine interface (HMI), new Level 2 Process Expert automation, as well as the central and local operator stations. A state-of-the-art Level 1 automation solution from Primetals Technologies helped to minimize the total shutdown period of the wire rod mill and to realize a fast and easy production ramp-up. Using a tablet style mobile control panel from Primetals Technologies, operators can safely control local equipment for inspection, adjustment, and other maintenance-related tasks.

The automation scope is rounded off by a cost-effective Level 2 process automation system. The Long Rolling (LR) Process Expert, developed by Primetals Technologies, is a platform for production management. Modules can be added to provide

insights into material tracking and quality control. They are based on actual production data. The system features a simple interface to evaluate plant performance and to execute production process related optimization measures. Together, these systems pave the way for greater interconnectivity and more effective plant management. The project scope also includes operating parts, guide equipment, offline devices for stand preparation, media systems, engineering services for other components, advisory services for construction and implementation, and training of personnel.

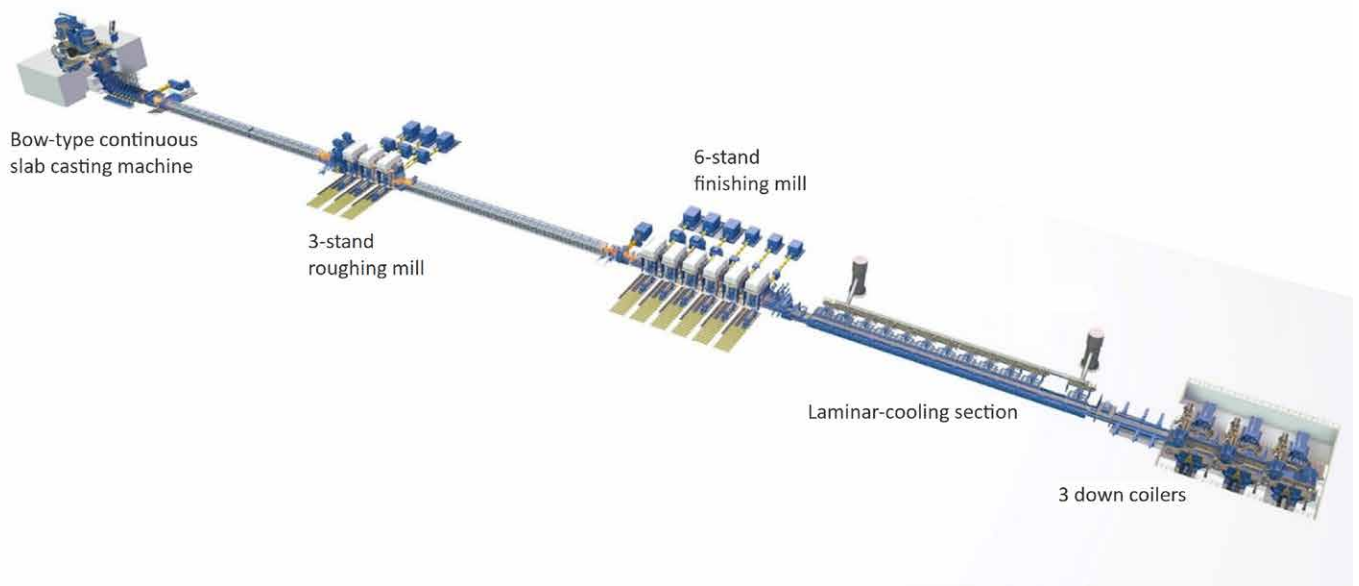
Kaptan Demir Çelik began production on its first rolling mill in 1964 and continues to expand its presence at Marmara Ereğlisi. Kaptan's products are used in more than 100 countries worldwide. With this reach, they have put themselves in pole position to lead the European market.

■ *Primetals Technologies*

MAXIMUM FLEXIBILITY

JSW Steel to invest in a new fully integrated casting and rolling plant

Indian steel producer JSW Steel will implement CSP® Nexus flat steel technology at the Dolvi Works on the west coast of Maharashtra. The plant, the third of its kind worldwide, is designed to produce both, hot strip and heavy plate on the same casting and rolling line, meaning maximum flexibility.



Layout of the new flat steel mill for JSW Steel Dolvi Works (Picture: SMS group)

Indian steel producer JSW Steel has placed an order with SMS group to supply the advanced CSP® Nexus technology for a new flat steel line at the Dolvi Works (Maharashtra). This order is the second time SMS group is supplying a CSP® plant to JSW Steel (Dolvi Works). JSW has been operating a typical CSP® plant from SMS group very successfully since 1998.

This plant – now with the new CSP® Nexus technology – not only promises maximum productivity but it will also expand the product mix in terms of widths and thicknesses. It is designed to achieve benchmarks regarding performance, efficiency and carbon footprint. SMS will construct the plant at Dolvi site and put it into operation in 2026.

Product flexibility. For the first time, hot strip and plate for shipbuilding, wind towers, heavy pipeline grades (API) or alike

with a maximum width of 2,600 millimetres can be produced on a single plant that comprises casting and direct rolling. The hot strip thickness range of 2.0 to 32.0 millimetres is exceptional and offers JSW Steel (Dolvi Works) a unique opportunity to open up new markets at a competitive cost level, particularly in the field of “green plate” production. With parameters like these, the CSP® Nexus plant for JSW Steel (Dolvi Works) is not only setting standards for thin slab casting and rolling plants, but also for conventional hot strip mills.

Plant characteristics. The scope of supply includes plant equipment as following:

- › a single-strand, bow-type caster with high throughput,
- › a multi-stand roughing mill that can reduce the slab thickness to the optimal transfer bar thickness,
- › a six-stand finishing mill,
- › a highly advanced laminar cooling system,
- › three down coilers are completing the plant,
- › automation technology for controlling the plant, including drive engineering and the array of technology packages, which feature sophisticated process models from the X-Pact® family of automation solutions.

With an annual capacity of four million tons, this is the highest capacity for a single-strand caster of this type anywhere in the world. Provision is made for a plant extension, either a second casting strand or a lateral slab feeding facility, to further boost the productivity to more than seven million tons in future.

The **continuous casting machine** will be capable to produce slabs with thickness up to 160 millimetres. This ensures

Development of the CSP® Nexus technology

As a pioneer of thin slab casting and rolling, the SMS Group has continued to develop this technology with each new plant built. With each new order, tailor-made solutions for specific market and customer requirements have been developed.

The world's first CSP® Nexus plant started operation in 2022 at the US steel producer SDI in Sinton, Texas. Secondly, a CSP® Nexus plant is

part of the ongoing greenfield project of H2 Green Steel in Sweden. With this fully electrified plant, H2 Green Steel is placing a strong focus on achieving near-zero greenhouse gas emissions from steel production.

Next, the CSP® Nexus plant at JSW Steel (Dolvi Works) will set new standards in productivity and dimensions of hot-rolled flat steel products.

an appropriate reduction ratio for particularly thick products and allows for a production throughput of up to 8.5 tons per minute and, going forward, has the potential to deliver 10 tons per minute.

Three **roughing stands**, located downstream of the first tunnel furnace, ensure the full range of transfer bar thicknesses. Even with larger slab dimensions, thin strip can be rolled. Roughing and finishing mill are decoupled by a heated roller table thus the roughing stands operate at highest rolling speed rates to meet the relevant temperature requirements and increase the overall energy efficiency of the plant. In addition to the three roughing stands, a high-performance six-stand **finishing mill** ensures the desired hot strip thickness range.

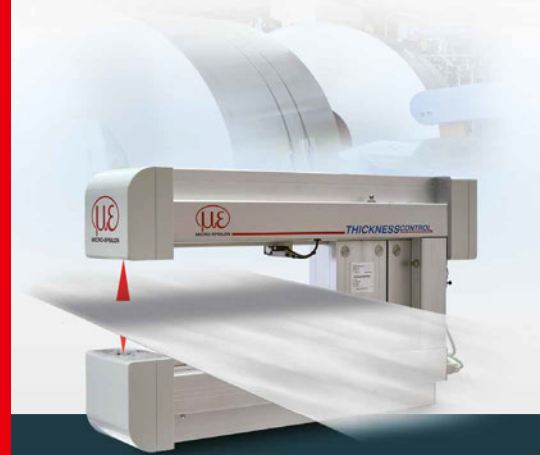
The **laminar cooling section** comprises nine super-reinforced microzone groups, which are designed to ensure both plant productivity and the mix of product dimensions. Three extremely robust down coilers complete the CSP® Nexus line.

Furthermore, SMS group equips the facility with a toolset of **digital solutions** that provide for the efficient use of plant data. By integrating the SMS

DataFactory, the QES quality management system, and the GeniusCM condition monitoring software into the production processes, JSW will benefit from remarkable improvements in both efficiency and predictability. These innovative tools enable real-time data analysis, and data-driven decision-making, ultimately improving overall production quality and performance.

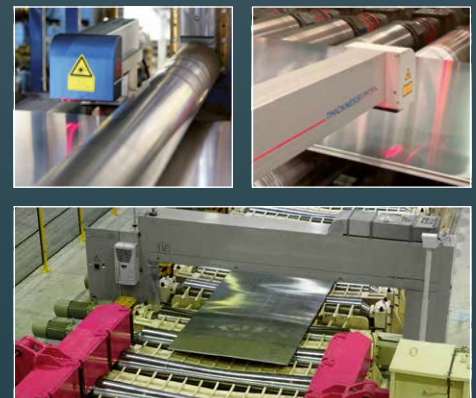
"With the CSP® Nexus plant at JSW, SMS group, inventor of thin slab technology, is once again demonstrating its innovative strength in the field of casting and rolling technology," says Cosimo Cecere, Head of Integrated Process Solutions Casting and Rolling Plants at SMS group. "In contrast to other available thin slab casting and rolling concepts on the market, CSP® Nexus is not just putting focus on a rather limited range of final products. CSP® Nexus offers a tailor-made solution best fitting for the individual customer needs, which in case of JSW Steel (Dolvi Works) are highest productivity with reduced energy consumption and CO₂ footprint in combination with a boundary breaking range of final product dimensions."

■ SMS group



More Precision Non-contact strip thickness measurement

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128,000 measuring points/sec provide high precision even for button plate and checker plate
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FLAT STEEL PRODUCTS

New hot rolling mill at Jindal Steel Odisha

The hot strip plant is designed for an annual production of five million tonnes of HRC. Latest generation rolling technologies ensure efficient and sustainable production of ultra-thin final gauges.



Roughing mill No. 2 in 4 hi-design with attached edger (Picture: SMS group)

Indian steel company Jindal Steel Odisha is a subsidiary of the O.P. Jindal Group. SMS group implemented the new hot rolling mill in the Angul works of Jindal Steel Odisha in the Indian federal state of Odisha. This is the first hot strip mill at this location. The company has a long and intensive cooperation with SMS, because SMS has already supplied several metallurgical plants to the Indian steel producer. Based on this confidence, Jindal Steel Odisha placed an order with SMS in 2021 for the construction of a 1,780 mm wide hot rolling plant, which is to be equipped with advanced technologies, especially with regard to thin final gauges. The hot strip mill comprises the following main units:

- › primary descaler,
- › roughing stand No. 1 in 2-hi design with attached edger,

- › roughing stand No. 2 in 4-hi design with attached edger,
- › transfer bar cooling system and HIBOX® heat preservation hoods,
- › mandrel-less coilbox, edge heating equipment, drum shear,
- › secondary descaler,
- › a seven stand finishing mill,
- › laminar cooling and
- › three downcoilers,

In addition, AMOVA, a company of SMS group, supplied a coil conveying system, coil strapping machines, marking machine and an inspection line.

Challenging products require advanced technology

In the roughing mill section, slabs with twelve-meter length maximum, a thick-

ness range from 180 to 260 millimetres and a width range from 800 to 1,680 millimetres are rolled down to transfer bar thickness. The range of hot strip thicknesses is 1.20 to 20.00 millimetres. In total, Jindal Steel Odisha's hot strip mill is designed for an annual capacity of five million tonnes.

The wide range of steel grades to be processed include, e.g. sophisticated grades such as HSLA, pipe grades and silicon steels. The share of high-strength material grades is more than 20 percent. Furthermore, very thin strips can be rolled reliably and stably. This is possible by implementation of various innovative rolling technologies.

Transfer bar cooling. For optimal temperature regulation in the roughing mill, SMS

installed the newly developed transfer bar cooling system. The transfer bar cooling prevents uncontrolled air-cooling during oscillation and comes with favourable effects on temperature profiles. The effects on the rolling process in the finishing mill are positive. By equalizing the temperature, product homogeneity is improved.

HIBOX® heat preservation hoods. Jindal Steel Odisha's HSM is equipped with the latest generation heat panels of the HIBOX® type. This simplifies the inspection and maintenance of the elements and increases the service life by factor four compared to conventional preservation hoods. Using the HIBOX® heat panels makes the finishing train's rolling behaviour more stable and Jindal Steel Odisha is able to shift the product mix toward smaller final thicknesses and/or higher strength steel grades. The HIBOX® system comes with resilient savings in terms of energy, CO₂ footprint and OPEX.

Mandrel-less coilbox. Arranged between the second roughing stand and the finishing mill, the coilbox forms transfer bar into coils and thereby equalizes the temperature over the transfer bar length. Coiling the transfer bar prevents the inner windings from cooling. Material and heat are accumulated, providing a positive effect on the material to be rolled and the production process. The improved transfer bar temperature allows expansion of the product range to thinner gauges.

Edge heater. The edge heater, located upstream of the finishing mill descaler, utilizes inductive heating. The primary role is to enhance strip edge quality by maintaining optimal pre-rolling temperatures. This ensures flawless production, even for advanced grades.

Finishing Mill. The seven-stand finishing mill in 4-hi design is equipped with hydraulic adjustment systems, hydraulic loopers and latest generation CVC® plus (Continuously Variable Crown) combined work roll shifting and bending systems. Also part of the supply was the X-Pact® Profile, Contour and Flatness process model (PCFC®)



The maintenance friendly modular insulating elements of the HIBOX® heat preservation hoods are mounted on the panels (Picture: SMS group)



Seven finishing mill stands are equipped with latest generation actuators (Picture: SMS group)

being able to cope all requirements in terms of producing high sophisticated products with an exceptional wide range of properties and dimensions. PCFC® calculates the optimal set points for the actuators of the CVC® plus and bending system. This is why PCFC® ensures the stability of the rolling process, highest product quality regarding strip geometry and a flexible rolling schedule.

The high-capacity HSM is completed by the laminar cooling system and three down coilers. AMOVA as an integrated business unit of SMS supplied the coil conveying system strapping machines, marking machine and inspection line.

■ SMS group

DEDICATED FOR HIGH-STRENGTH STEEL

Advanced cooling technology for strip processing lines

Hyundai Steel, a leading steel manufacturer in East Asia, entrusted Fives, an international engineering group, with a revolutionary solution to modernize its existing production line.



Dry FlashCooling® technology was integrated into the continuous annealing and galvanizing line at Hyundai Steel (Picture: Fives)

Hyundai Steel needed a dedicated solution to produce 3rd generation steel for the automotive industry in which the company is a reference manufacturer. Fives offered its breakthrough Dry FlashCooling® technology to integrate into the continuous annealing and galvanizing line (CAGL) to achieve the result. 3rd generation steel is an advanced high-strength steel (AHSS) that is used in the automotive industry. It is a lightweight steel that has an outstanding combination of mechanical properties and formability, compared to conventional mild steels.

“Our main target was to find a solution to produce 3rd generation steel with a tensile strength from 1,000 MPa to 1,700 MPa. Through feasibility studies, we determined that the line’s cooling section had to be completely revamped. The challenge was to fit a new cooling section into the existing line, make it compatible with

our process, and ensure it meets safety requirements,” says Jin-Hyoung Park, Team Leader of CRM Process R&D at Hyundai Steel.

Key process technology

Dry FlashCooling®, a rapid cooling system developed by Fives, is a key process technology that enables the production of new high-strength steel grades. “Our technical team worked closely with Hyundai Steel and conducted numerous feasibility studies to customize the solution. The design of the Dry FlashCooling® system, which runs on 75% hydrogen, allows limited hydrogen consumption thanks to a special recovery system. In addition, electricity consumption is also reduced by almost 6 times when the highest cooling rates are achieved,” says Camille Moukarzel, Business Development and Sales Manager at Fives Stein, a Fives subsidiary specializing in thermal and cooling technologies.

Fives’ long-term partnership with Hyundai Steel demonstrates its commitment to produce customized solutions that position steelmakers at the top of the industry.

■ Fives Group

The challenge was to fit a new cooling section into the existing line, make it compatible with our process, and ensure it meets safety requirements.

Jin-Hyoung Park, Team Leader of CRM Process R&D at Hyundai Steel

ENERGY REVOLUTION

Electrical steel for electromobility

thyssenkrupp Steel has commissioned a new slitting line at the Motta Visconti service centre in Italy. The line is part of the company's investment in electric mobility and supports the supply of high-efficiency non-grain oriented electrical steel strip for the automotive industry.



New slitting line to meet the increased demand for high-quality electrical steel

(Picture: thyssenkrupp Steel)

With an operating speed of 500 meters per minute the Motta Visconti service centre of thyssenkrupp Steel has doubled its production capacity for NO electrical steel strip. With this investment, thyssenkrupp Steel is further expanding its expertise in the mobility revolution and the energy transition.

Above all, the new slitting line is designed to cut very demanding strip, particularly thin electrical steel – starting from a thickness of 0.20 millimetres: This material is processed further in lamination stamping shops, and ultimately installed in high-performance traction motors for electric vehicles. The new slitting line also possesses a state-of-the-art, laser-controlled measuring unit that continuously measures the material thickness and width, as well as a flexible-band brake for cutting products with particularly sensitive

coatings, such as adhesive insulating varnishes.

“The new line replaces an existing one that is more than 30 years old and has been built to meet the increased demand from our customers for particularly high-quality electrical steel,” says Roberto Briano, Managing Director of thyssenkrupp Electrical Steel Italia. “No energy and mobility revolution without steel. Electrical steel strips from thyssenkrupp are our contribution to sustainable and efficient mobility. With the new slitting line, we are strengthening our position as a leading supplier of innovative material solutions for electric mobility,” says Miguel Arrabal, head of the Non-Grain-Oriented Electrical Steel (NO) business unit at thyssenkrupp Steel. “We are proud that we can offer our customers in Italy and neighbouring regions products that meet

the highest standards. As a leading European manufacturer of electrical steel, we are supporting our customers in the transformation of mobility towards electric drives.”

New steel grade for extended range electric vehicles

The new line in Motta Visconti is also able to produce NO25, the latest grade from thyssenkrupp Steel which, with a thickness of 0.25 mm, is characterized by advanced magnetic properties. These include a guaranteed magnetization change loss of just 12.5 W/kg, a core loss that is an important property of electrical steel strip. This is influenced by the sheet thickness, the alloy, and the production process of the material. It determines how efficiently a motor utilizes electrical energy and converts it into rotational energy. Small hysteresis losses mean high motor efficiency. Higher efficiency enables an electric vehicle to drive further on one battery charge or makes it possible to reduce the battery capacity while maintaining the same range. This reduces the weight of the battery and therefore of the vehicle, as well as the production costs for automotive manufacturers.

The electrification of mobility is leading to increased demand for advanced and particularly thin products with a high silicon content, such as those offered by thyssenkrupp Steel under the brand name powercore® Traction. “We are delighted to be able to support our customers with products such as our NO25 as part of the transformation to e-mobility,” says Arrabal. All products are also available as blue-mint®, the CO₂-reduced steel from thyssenkrupp Steel, which further increases the sustainability of the material.

■ *thyssenkrupp Steel Europe*

ZERO-DEFECTS APPROACH

Enhancing quality assurance for automotive applications

ArcelorMittal Wire Solutions has unveiled a pivotal €1 million investment geared towards amplifying its inspection capacity at its bright steel site in Dortmund, Germany. This move is poised to revolutionise the ability to deliver products with zero defects, precisely tailored to meet the exacting needs of the automotive industry. This strategic endeavour underscores an unwavering commitment to excellence and customer satisfaction.

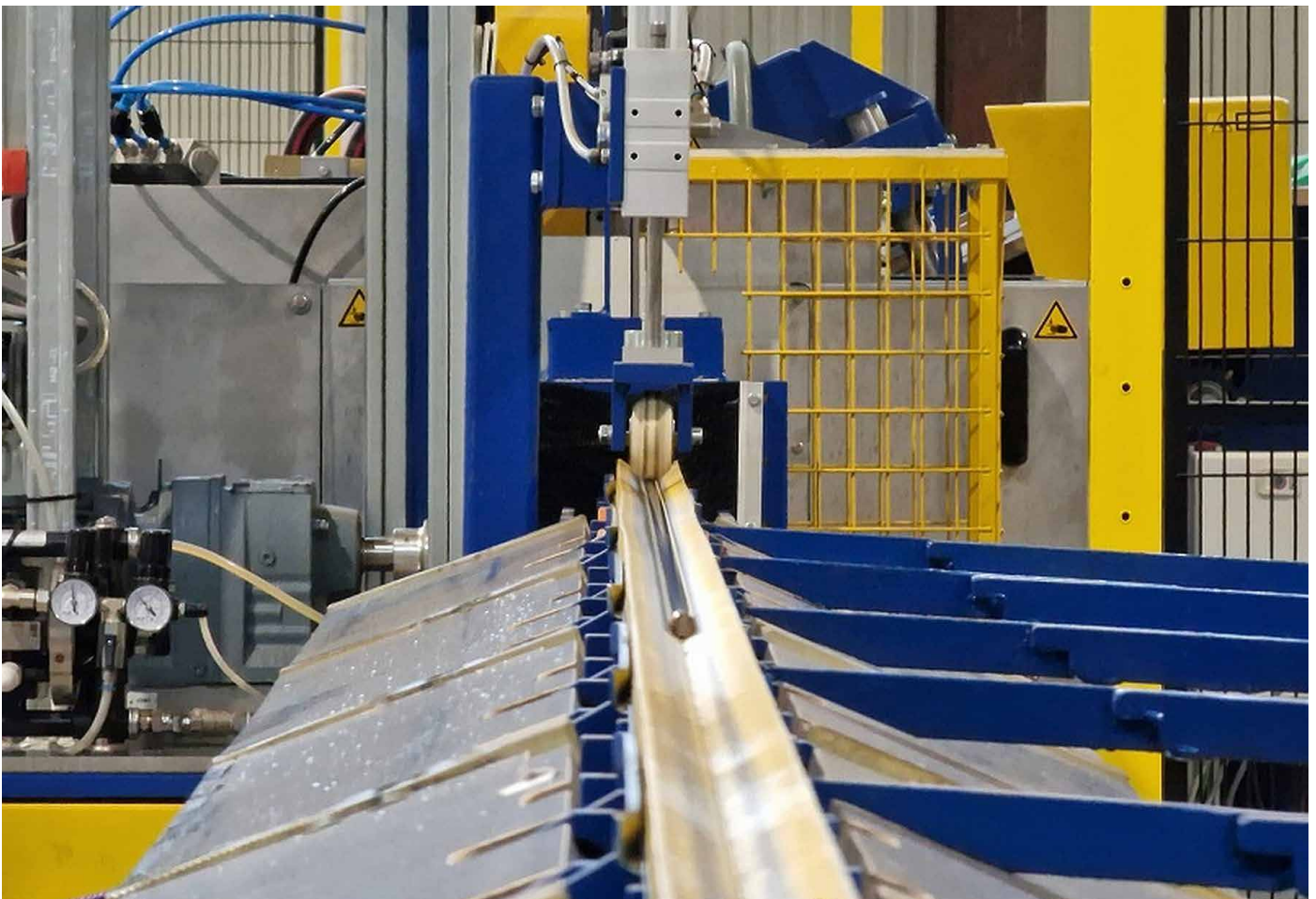
The investment's impact is profound, particularly in ensuring that hexagon and round bars adhere to the stringent quality standards demanded by the automotive sector. By leveraging cutting-edge technology and meticulously engineered processes, ArcelorMittal is aiming to bolster the capability to deliver flawlessly engineered components, there-

by elevating industry benchmarks. This investment highlights the magnitude of the company's advancements but also underscores the meticulous attention to detail ingrained in quality assurance protocols.

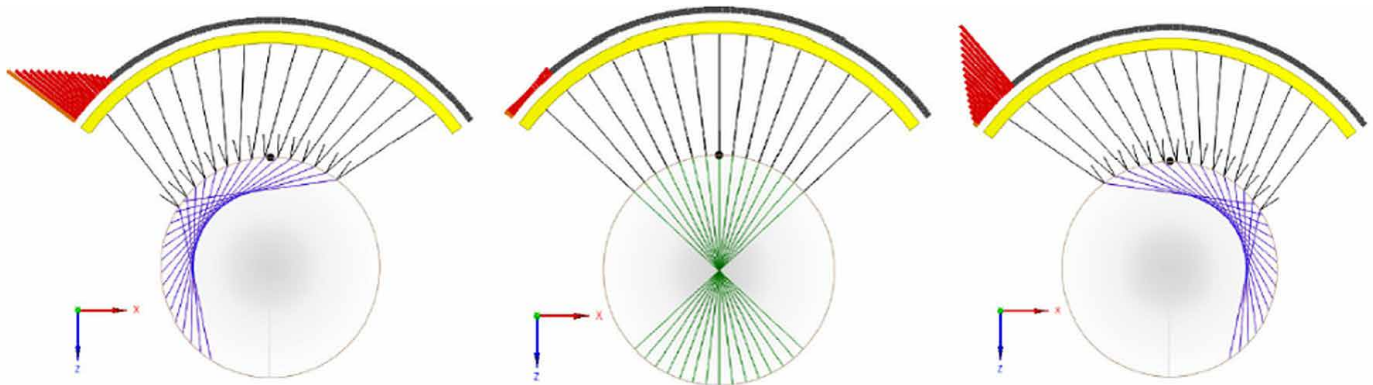
Dimensions. The investment enables precise fabrication within a range of 10 to 35

mm (round) and 10 to 30 mm (hexagon), catering to a spectrum of automotive, engineering, construction and agriculture applications.

Length for testing. Bars spanning from 2,800 to 6,100 mm – a comprehensive testing coverage. Crucially, only segments less than 50 mm at the head and 30 mm



The new inspection line supports precise fabrication of round and hexagon bars for automotive and other demanding applications (Picture: ArcelorMittal)



Phased array ultrasonics employ an array of vertical (middle) and angular techniques (clockwise and counterclockwise) to detect defects (Picture: ArcelorMittal)

at the end remain untested, ensuring rigorous scrutiny where it matters most.

Phased array ultrasonics. Employing a sophisticated array of vertical and angular ultrasonic techniques, both clockwise and counterclockwise, defect detection capabilities are enhanced with unprecedented precision.

Detectable defects. The system is adept at identifying a range of imperfections, from cracks and holes to core defects, even those perilously close to the component's edge, leaving no room for compromise in quality.

Test sensitivity. With a remarkable sensitivity of KSR 0.7 mm, the testing apparatus possesses the acuity to discern minute flaws, ensuring that no defect goes unnoticed.

A subsidiary of ArcelorMittal, WireSolutions has overcome the pitfalls of past and is today resolutely oriented towards the future in the research of excellence for its customers. WireSolutions offers a diversified portfolio of low and high carbon wires, strands, ropes and corrosion-resistant solutions. ArcelorMittal Bright Bars offers an extensive range of products including:

- low carbon steel for free cutting with sulphur, with or without lead,
- free cutting steel grades for heat treatment,
- carbon grades, with or without lead,
- alloyed grades.

The extensive range of services includes cut to length for requirements, tailored packaging options as well as metallurgical expertise for specific applications or production process are available to support our customers.

■ *ArcelorMittal*

Meranti Green Steel eyeing on the European market

INTERFER Edelstahl Handelsgesellschaft mbH, a leading European steel importer renowned for its global network and exceptional services, has joined forces with Meranti Green Steel to support Meranti's mission of becoming a premier supplier of Green Hot Rolled Coils from the Asia-Pacific region to Europe.

Headquartered in Karlsruhe, Germany, with offices spanning across Europe, the USA, and China, INTERFER have an extensive distribution network worldwide. Meranti Green Steel, based in Singapore, is pioneering green steel production across the Asia-Pacific region, integrating cutting-edge processes such as direct reduc-

tion in Western Australia, in partnership with GSWA, with steelmaking in South-East Asia, using renewable energy sources like solar and wind farms.

Harold Quek, Vice President of Business Development at Meranti Green Steel, expressed enthusiasm about the partnership, stating, "After collaborating with local partners, raw material suppliers, and operational partners, we are thrilled to now enter into offtake partnerships concerning our future Green HRC products. We are extremely proud to have INTERFER / Belmont & Knott as our inaugural offtake partner. Our missions are fully aligned, and we both aim to supply sustainable quality products to our customers."

The offtake partnership delineates various phases of responsibilities, with INTERFER and Meranti Green Steel working together in market acquisition, technical support, commercial activities, logistics, legalization, and later supply and offtake of Green HRC. The parties are eyeing a range of market segments, including in the UK. Both entities strive to accelerate the adoption of sustainable steel production practices against the background of the European Carbon Border Adjustment Mechanism (CBAM).

■ *INTERFER / Meranti Green Steel*

LOGISTICS

Swap body transporter in hot-dip galvanised design

TII KAMAG has improved its efficient swap body transporter, the KAMAG PrecisionMover, in a now hot-dip galvanised version. Galvanising the lifting table, frame and cab mounting system enhances corrosion resistance and service life of the vehicle.



The galvanised frame, lifting table and cab mounting system provides the KAMAG PrecisionMover with reliable corrosion protection
(Photo: TII Group)

TII KAMAG, a leading manufacturer of special vehicles and specialist for transport solutions in handling operations, offers a wide range of solutions for diverse transportation tasks. This also includes the KAMAG PrecisionMover swap body transporter which is known for its efficiency and manoeuvrability in cargo handling operations. This vehicle has been specially designed for logistics service

providers, couriers, express and parcel service operators as well as sub-contractors who rely on fast and efficient processes at their logistics yards. The KAMAG PrecisionMover has proven itself to be reliable and safe in tough, continuous use and when subjected to extreme conditions.

A significant upgrade to the KAMAG PrecisionMover is therefore the introduc-

tion of hot-dip galvanized components including the lifting table, vehicle frame and cabin suspension system. The benefits of galvanisation include improved durability and corrosion resistance which are critical to vehicle robustness. Galvanisation provides very effective and reliable resistance to rust and facilitates self-healing in the event of minor damage. Galvanised surfaces are robust and resistant to

different temperatures without compromising any of their protective characteristics. As a result, the KAMAG PrecisionMover can also be used during extreme weather conditions as well as under increased mechanical stress.

By integrating galvanised components, TII KAMAG not only extends the service life of the KAMAG PrecisionMover but also contributes to economic efficiency and environmental compatibility. Galvanised parts require less maintenance and are recyclable thus making them a sustainable choice. "The hot-dip galvanised KAMAG PrecisionMover is also an example of our commitment to implementing environmentally-friendly solutions. Galvanising is considered a resource-saving corrosion protection process that helps reduce the ecological footprint. We are committed to sustainability in the transport industry whereby the special requirements and challenges of our customers are always at the forefront," emphasised Jürgen Haupt, Head of Sales Logistics at TII KAMAG.

Galvanising is considered a resource-saving corrosion protection process that helps reduce the ecological footprint.

Jürgen Haupt, Head of Sales Logistics at TII KAMAG

Since its market launch in 1995, the KAMAG PrecisionMover, formerly known as the "Wiesel", has established itself as a best seller in the internal transport industry. With over 2,500 KAMAG PrecisionMover swap body transporters in more than 20 European countries, TII KAMAG has a very strong footprint in this segment. Users particularly appreciate the vehicle's

high level of economic efficiency and practicality when handling swap bodies, trailers and semi-trailers.

TII Group

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PROJECT PIPELINE SUPPLY BECOMES N'GENIUS PRODUCT PACKAGE DISTRIBUTOR

Stainless steel manufacturer and stockist, Project Pipeline Supply (PPS), has reached an agreement to sell and distribute pipeline and piping packages with products made from the N'GENIUS series of high strength austenitic stainless steels.

Project Pipeline Supply (PPS) provide pipes, fittings, flanges, components and specialist equipment to the offshore oil and gas, process, renewables and defense industries. The agreement will allow PPS to offer customers total packages of products made using the N'GENIUS series. As a complete 'family' of grades, N'GENIUS represents a wide selection of new high-performance materials featuring outstanding strength and corrosion resistance combined with excellent ductility and toughness at ambient, sub-zero and cryogenic temperatures. David Toone, Managing Director at PPS, commenting on the agreement: "The potential application of these materials in the hydrogen transport and storage sector will be particularly significant." "With such a vast range of grades – all of them high strength austenitic – the N'GENIUS series enables engineers to use the same type of material



David Toone, Managing Director at PPS, (left) and Dr Ces Roscoe, CEO of N'GENIUS Materials Technology, after signing the agreement (Picture: N'GENIUS Materials Technology)

which meets the requirements of virtually every pipeline and piping package," Dr Ces Roscoe, CEO of N'GENIUS Materials Technology, adds.

■ *Project Pipeline Supply (PPS) / N'GENIUS Materials Technology*

KLÖCKNER & CO PRESENTS 2023 RESULTS AND FUTURE MARKET FOCUS

Klöckner & Co generated a solid operating income (EBITDA) before material special effects of 190 million euros in fiscal year 2023 (2022: 355 million euros). As forecast, sales showed a considerable decrease due to the lower steel price level and amounted to 7.0 billion euros (2022: 8.3 billion euros).

Klöckner & Co continues to focus on core markets in North America and its attractive European activities in Germany, Austria and Switzerland. With the successful completion of the acquisition of National Material of Mexico by the US subsidiary Klöckner Metals Corporation, Klöckner & Co has strengthened its leading position in steel and metals distribution and the steel service business in North America. The acquisition of the US metal components manufacturer Industrial Manufactur-

ing Services further supplemented the product and service portfolio along the customer value chain, particularly in welding and parts production. Following the successful completion of the sale of the country organizations in France, the United Kingdom, the Netherlands and Belgium in March 2024, the company will focus even more strongly in the future on the lucrative processing and metalworking business. For 2024, Klöckner & Co expects considerably stronger demand in its key European and North American markets. Accordingly, the company is forecasting a considerable increase in shipments and sales.

Klöckner & Co significantly expanded its Nexigen® product and service portfolio, setting new standards for CO₂ emission tracking in the steel industry. The services are based on an algorithm able to calculate

and state the individual product carbon footprint for each of the approximately 190,000 Klöckner products. In order to significantly increase the availability of CO₂-reduced steel for customers, Klöckner & Co has also expanded its strategic partnerships with Salzgitter and the GMH group.

The company already scored a major success in reducing its own carbon emissions during the reporting year: With a 52% reduction in directly controllable carbon emissions (scopes 1 and 2) compared to the 2019 baseline, Klöckner & Co has already achieved one reduction target for 2030 ahead of schedule.

■ *Klöckner & Co*

SALZGITTER SIGNS MOU WITH STEELARIS ON LOW-CO₂ STEEL SUPPLY

A memorandum of understanding has been signed between Salzgitter Mannesmann International GmbH, Ilsenburger Grobblech GmbH and Singapore-based Steelar is Pte Ltd.

Stee lar is supplies customers in Singapore and the ASEAN countries with steel products and services for the construction sector, as well as the offshore and marine industries. In future, Steelar is will purchase CO₂-reduced SALCOS®-steel from the Salzgitter group via Salzgitter Mannesmann International.

The first 380 t of hot-rolled sheets from group sister company Ilsenburger Grobblech are expected to be delivered by Salzgitter Mannesmann International in April 2024. The CO₂-reduced SALCOS®-steel for this comes from Peiner Träger GmbH. The slabs are already being produced there from high-quality steel scrap using electric arc furnaces and continuous casting systems. In the future, the Salzgitter group will be pursuing the SALCOS® – Salzgitter Low CO₂ Steelmaking transformation program, according to which Salzgitter will be incrementally converting its steel production to hydro-



From left: Sandra Unterschwaiger, Salzgitter Mannesmann Handel; Oliver Laubner, Ilsenburger Grobblech; Alexander Soboll, Salzgitter Mannesmann Handel; and Ang Tee Seng, Allen Ang, Johnsen Tee and Handi Ho, all Steelar is, during the signing ceremony (Picture: Salzgitter)

gen-based processes. The aim is to achieve virtually CO₂-free production operations, starting from 2026.

■ *Salzgitter Mannesmann International / Ilsenburger Grobblech / Steelar is*

SSAB COOPERATES WITH TAMPERE UNIVERSITY ON RESEARCH IN STEEL CONSTRUCTION

SSAB Europe and Ruukki Construction have concluded a five-year cooperation agreement with Tampere University in Finland concerning research and education in steel structures and construction.

The agreement, which continues a long period of close cooperation, aims to strengthen research activities in steel construction both in Tampere and nationally. The education seeks to secure internationally high-caliber design expertise in steel structures and construction in Finland.

The research will focus on the study of low-carbon steel construction in accord-

ance with Finland's and Europe's climate goals. In addition, research on traditional structural engineering issues will continue.

Tampere University has long experience of cooperation with SSAB and Ruukki. The first such partnership agreement was signed back in 2013 with what was then Tampere University of Technology. At the same time, Tampere University is the only Finnish university with a professorship in steel construction in the field of civil engineering.

The cooperation agreement includes an annual discussion with companies on what kind of research topics are relevant

to them. Topics can come from both the needs of companies and researchers. In practice, there is a wide range of research collaboration from small experimental studies to doctoral dissertation projects and projects with third parties. During the current agreement period, the aim is also to research larger concepts, for which EU funding is sought with international partners.

■ *SSAB / Ruukki Construction*

DILLINGER AND ØRSTED SIGN MOU ON FIRST ACCESS TO LOWER-EMISSION HEAVY PLATE

Global offshore wind park operator Ørsted and heavy steel plate producer Aktien-Gesellschaft der Dillinger Hüttenwerke have agreed that Ørsted will be offered the first production of lower-emission steel from Dillinger, subject to availability and commercial terms and conditions.

Steel plates are used in offshore wind monopile foundations and one of the largest sources of carbon emissions in an offshore wind farm’s life cycle, accounting for 21%. Reducing those emissions is key for Ørsted to reach its 2040 science-based net-zero target.

Under a large-scale supply agreement entered into in 2022, Ørsted will procure significant volumes of regular heavy plate steel from 2024. Through this memorandum of understanding, Ørsted supports Dillinger’s efforts to drive the decarbonization of steel production and leverages its influence to secure resilient supply chains and steel capacity. Ørsted expects to be able to procure lower-emission steel produced at Dillinger’s plant in Dillingen, Germany, from 2027-2028.



Shipment of monopile foundations for offshore wind turbines (Picture: Ørsted)

The EU recently passed the Net Zero Industry Act, which makes non-price criteria in renewable energy auctions mandatory within the EU. Thus, the agreement with Dillinger not only helps accelerate the decarbonization of the steel industry. It also

provides Ørsted with the optionality to deliver on expected decarbonization criteria in coming auctions when they materialize.

■ *Dillinger / Ørsted*

TATA STEEL TO SUPPLY OF REDUCED CARBON FOOTPRINT STEEL TO GEDIA

Tata Steel Nederland has signed a memorandum of understanding with Germany-based GEDIA Automotive for the long-term supply of steel with a reduced environmental footprint.

Initially, Tata Steel intends to provide GEDIA with Zeremis® Carbon Lite, a steel with an allocated carbon footprint reduction of up to 90% for the sum of scope 1,

2 and 3 emissions. It is envisaged that the supply will transition to Zeremis embodied green steel when the IJmuiden steelworks adopts its new steelmaking route. To further decarbonize GEDIA’s value chain in the shorter term, the companies have agreed to explore opportunities to reduce emissions associated with steel transportation.

GEDIA develops and manufactures lightweight structural body parts and chas-

sis components for leading automotive manufacturers. The agreement with Tata Steel will help GEDIA decarbonize its value chain, thus supporting its customers in their efforts to produce cars and trucks more sustainably.

■ *Tata Steel / GEDIA Automotive*

OVAKO AND TIBNOR PARTNER TO ADVANCE LOW CARBON FOOTPRINT STEEL SOLUTIONS

Ovako and Tibnor have entered into a strategic partnership to promote low carbon footprint solutions in steel production and products.

The key objectives set out in the agreement include commitment to world-leading low carbon footprint products across all deliver-

ies; reserved capacity by Ovako to supply low carbon footprint products as per Tibnor’s demand; integration of CO₂ parameters in relevant specifications; and joint market activities to promote low carbon footprint solutions, especially in the Nordic market.

As more industrial players are committing to science-based climate targets and

legislators are pushing companies to reduce their emissions or to pay the true cost for pollution, both Ovako and Tibnor recognize decarbonization as a natural competitive advantage.

■ *Ovako / Tibnor*

ADDITIVE MANUFACTURING

New tools for ageing strapping machine

Can 3D printed and laser hardened tools meet the tough demands of steel coil production and dispatch? The answer is yes, and SSAB has proven it.



At the top a 3D-printed blank and the part below it is a finished and laser-hardened stamp after use in production (Picture: SSAB)



Punched strap (left) and the locking mechanism (right) with stamp, 3D printed and laser hardened (Picture: SSAB)



At SSAB's operations in Borlänge (Sweden), Signode straps are used to prevent the coils from opening and to ensure safe shipping. The straps are held in place by a stamping operation which locks the strap ends together. Some of the strapping machines are old and the supplier can no longer supply spare parts and tools. This problem prompted the maintenance department to look for new sources of spare parts. One method that can produce parts quickly is 3D printing, and they decided to try it out.

The blanks for the stamps were manufactured using 3D printing at SSAB in Oxelösund, Sweden. After printing, the

stamps were processed to final tolerance and then sent for laser hardening of the wear surfaces.

Laser hardening is based on a surface being heated by the energy from a laser beam and then rapidly cooled, i.e. quenched, by the surrounding material. The main advantage of laser hardening is that only the surface that needs increased hardness is hardened, which gives low energy input and thus minimal distortions.

"3D printing in combination with SSAB TS2 powder generates a material that is both hard and tough, and by laser hardening the material, we have obtained a prod-

uct that has performed beyond expectations," says Jesper Vang, Head of Powder Technology at SSAB. The 3D-printed stamps with laser hardening had a lifespan three times longer than the stamps used earlier. In addition to improved service life, the manufacturing cost is significantly lower.

Work is now underway to identify more components in SSAB's various facilities where it is possible to take advantage of the benefits of 3D printing and laser hardening.

■ SSAB

TRANSPARENCY IN THE PRODUCT CARBON FOOTPRINT

Supplier and customer exchange emissions data along the value chain

Swiss Steel Group, a global supplier of long specialty steel, has joined forces with hot forging company Dirostahl and drive manufacturer Flender to take a pioneering step in sharing emissions data. This strategic partnership, which includes the sharing of downstream emissions data, marks a significant milestone in the industry and sets new standards for transparent sustainability.

In a market where sharing emissions data from suppliers with customers is already considered standard practice, the Swiss Steel Group (SSG) took on a pioneering role last year. The latest development now sees SSG taking an innovative step together with German steel company Dirostahl and drive manufacturer Flender and entering into a partnership for the exchange of emissions data. Dirostahl and Flender, both major customers of SSG, are sharing their emissions data with Swiss Steel Group, resulting in a previously unusual data exchange in the other direction – from customer to supplier.

“We clearly see it as our responsibility to reduce our carbon footprint. At the operational level, Scope 1 and 2 are being reduced through energy efficiency measures. In order to become climate-neutral in our Scope 1 in the future, the supply of green hydrogen under economic conditions is a prerequisite. The purchase of green steel from upstream suppliers would reduce our Scope 3 accordingly and thus also reduce our customers’ product carbon footprint. The exchange of data between steel producers, processors and end customers enables us to use certified data to transparently describe CO₂ emissions along the entire value chain and jointly develop approaches to reduce them. Value creation in favor of the environment, rather than the lowest cost price, is becoming increasingly important in terms of climate protection. For this reason, we look forward to working transparently with Swiss Steel Group and Flender Group,” says Markus Lüke, CEO of Dirostahl Group.

Through this unique exchange, Swiss Steel Group can not only calculate its Scope 3 downstream emissions more accurately, but also report a more reliable carbon footprint. This example of reverse emissions data



Andreas Evertz, CEO of Flender Group
(Picture: Flender)

sharing is the first of its kind in the industry and sets new standards for transparent collaboration. “Industry and business must lead the way in the energy transition and protecting our climate. Our goal at Flender is to be CO₂-neutral in Scopes 1 and 2 by 2030 and to save 30% in Scope 3. The supply chain plays a decisive role here. In cooperation with strong partners such as Swiss Steel Group

and Dirostahl, we are pleased to make our Scope 3 emissions transparent and to take measures to reduce them as well,” says Andreas Evertz, CEO of Flender Group.

Frank Koch, CEO of Swiss Steel Group, emphasizes: “With the help of this data, Swiss Steel Group can not only calculate its own carbon footprint more accurately, but also offer its customers Dirostahl and Flender an improved advisory service. This enables a more targeted selection of materials that can reduce energy consumption and thus further minimize direct emissions in customer processes.”

This pioneering partnership underlines the commitment of Swiss Steel Group, which is also the current winner of the German Sustainability Award, to transparent sustainability and emphasizes its position as a pioneer and thought leader in the industry. By working with Dirostahl and Flender, Swiss Steel Group is setting new standards for emissions data sharing and demonstrating a clear path for how companies can work together to contribute to a more sustainable future.

■ *Swiss Steel Group*



Our goal at Flender is to be CO₂-neutral in Scopes 1 and 2 by 2030 and to save 30% in Scope 3. The supply chain plays a decisive role here.

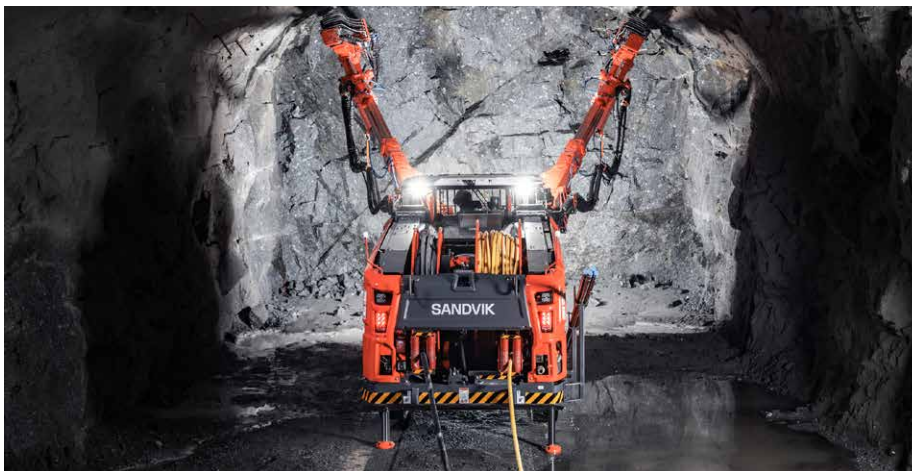
Andreas Evertz, CEO of Flender Group



TRANSPARENCY IN THE PRODUCT CARBON FOOTPRINT

Alleima releases carbon footprint data to Sandvik Rock Tools

Alleima will be one of the first companies to implement Life Cycle Assessment (LCA) for rock drill steel products for the mining industry. As a start, Alleima will release carbon footprint data for its rock drill steel products and to its customer Sandvik Rock Tools.



Sandvik Rock Tools will in future receive a certified PCF document from Alleima for the steel from which the rock drill stems are manufactured (Picture: Alleima)

Climate change is an existential threat to the world. With rising carbon dioxide emissions at the heart of this threat, European Union has committed to creating a climate-neutral society by 2050, and reducing greenhouse gas emissions by 55% by 2030, compared to 1990 levels. One of the keyways in which industries can support these climate goals is by reducing the levels of carbon they emit. Therefore, Alleima, a leading manufacturer of high value-added products in advanced stainless steels, special alloys, has decided to implement Life Cycle Assessment (LCA) and will be one of the first companies to provide product-specific carbon footprint for rock drill steel products for the mining industry. Each product will have a third-party verified carbon footprint. "Third-party verification is very important as it shows that the result is reliable and that calculations have been made according to the standard. This is in line with our strategy to provide the market with sustainable products and solutions. Sandvik Rock Tools leads the way in transitioning to a more sustainable business

within our industry by acting as an innovative business partner that delivers sustainable values for all stakeholders", says Boel Schylander, Vice President Sustainability at Sandvik Mining and Rock Solutions.

"We are pleased to tell that we can now support Sandvik Rock Tools with a product-specific carbon footprint. By collaborating with our customers and implementing sustainable solutions, we can all contribute to making greener choices for the industry. Sustainability is of crucial importance for the society around us as

well as for our customers and LCA will be important for businesses in the future. The next step for Alleima is to expand this approach across the entire production chain, verifying downstream products in the production flow", says Mattias Eriksson, Global Product Manager for Rock Drill Steel products at Alleima.

Rock drill steel (RDS) products from Alleima have a low carbon footprint, i.e.: 0.9 tonnes of CO₂ per tonne of Sanbar® 64 steel produced by Alleima (compared to 2.1 tonnes of CO₂ per tonne of steel from generic data). Alleima has significantly reduced carbon emissions through efficient processes, the use of fossil-free electricity, and dedicated investments such as switching to fossil-free fuels for heat treatment. Alleima products have a high scrap content, reducing the need for primary resources.

Alleima has been reusing steel scrap in production for over 100 years. To use electric arc furnace is today given and there is a strong focus on reducing the carbon footprint through the whole organization. In December 2022, Alleima decided to commit to set science-based net-zero targets, consistent with the Paris Agreement. Sandvik Rock Tools has also committed to the science-based targets initiative (SBTi).

Alleima AB

Third party verification is very important as it shows that the result is reliable and calculated according to the standard.

Boel Schylander, Vice President Sustainability at Sandvik Mining and Rock Solutions

LOW SCOPE 3 RENEWABLES

Siemens Energy to reduce carbon footprint of transformers in offshore wind farms

Around 700 transformers made of CO₂-reduced electrical steel are to be installed in the nacelles of offshore wind turbines for Siemens Energy's wind power business Siemens Gamesa. More than 12,000 t of CO₂ will be avoided in the production of bluemint® powercore® steel supplied by thyssenkrupp Steel.



Around 700 transformers for wind turbines will be made of CO₂-reduced bluemint® powercore® electrical steel (Picture: thyssenkrupp Steel)

Thyssenkrupp Electrical Steel has received the largest ever order from Siemens Energy for bluemint® powercore® to equip around 700 transformers in offshore wind turbines from its wind business Siemens Gamesa – a record order for thyssenkrupp Electrical Steel. The two frontrunners in decarbonization intend to lead the decarbonization of the electricity industry and as well to secure capacity of CO₂-reduced steel, enabling a resilient and sustainable supply chain for the energy transition.

The project is a double benefit for climate protection in Europe: In the future, even more green electricity will be generated in offshore wind turbines, while at the same time the CO₂ footprint of manufacturing transformers in the wind turbines will be reduced through the use of the

highly efficient grain-oriented electrical steel bluemint® powercore®.

The cores of transformers in offshore wind turbines are made of grain-orient-

ed electrical steel. This special steel enables transformers to operate with a high level of efficiency, transforming electric energy with as little loss as possible. The lower the iron losses of the electrical steel, the higher the efficiency. This is key when it comes to meeting increasing demand for electricity and the need to generate more power from renewable sources. They ensure that the green electricity is efficiently converted from low to medium voltage and fed into the local power grids via high-voltage lines or underground cables with low losses.

Siemens Energy will manufacture the 700 transformers made of bluemint® powercore® at its Weiz plant in Austria. They will later be used at Siemens Gamesa's offshore wind farms in Germany, UK and France. The first project equipped with these CO₂-reduced transformers will be Ocean Winds' Moray West offshore wind farm in the UK. Ocean Winds develops, finances, builds, and operates offshore wind farms all over the world. With this project, Ocean Winds not only reduces

The partnership with thyssenkrupp Electrical Steel will be a decisive step forward for us and thus also for our customers in reducing Scope 3 emissions.

Tilo Else, Vice President Procurement Grid Technologies at Siemens Energy

bluemint® Steel – certified CO₂ saving

bluemint® powercore® realizes the CO₂ reduction by using a specially processed scrap recycling product in the blast furnace at the thyssenkrupp Steel site in Duisburg. This technological change will result in an absolute reduction of CO₂ emissions at the Duisburg (Germany) site, because less coal is needed for the reduction process in the blast furnace. Using a mass balance approach, only the scrap-based production route in the blast furnace is considered. TÜV Süd confirmed this approach in accordance with the VERISteel

procedure and certified bluemint Steel as a product with a reduced CO₂ intensity. With this approach, thyssenkrupp Steel can already offer CO₂-reduced products today. However, the aim is to make the entire production process climate-neutral with the tkH₂Steel transformation project. To this end, thyssenkrupp Steel is building a direct reduction plant at the Duisburg site, which will also save CO₂ emissions on a global scale from 2027 by using hydrogen and renewable electricity.

greenhouse gas emissions in the generation of electricity, it now tackles the CO₂ emissions of the equipment itself.

Working together for a climate-friendly energy transition in Europe

The project is a milestone in the collaboration between thyssenkrupp Electrical Steel and Siemens Energy to drive the future energy transition with climate-friendly top-of-the-line products within Europe. thyssenkrupp Electrical Steel has established itself as a key technology partner for CO₂-reduced, grain-oriented electrical steel – the company already supplies an up to 50 percent CO₂-reduced steel product based on alternative feedstocks in the manufacturing process.

“For us, it was the next logical step to work closely with Siemens Energy on decarbonization. Siemens Energy’s CO₂ footprint is inextricably linked to thyssenkrupp Electrical Steel as a material supplier. The current project is a milestone in our strategic partnership and can serve as a model for establishing green markets,” says Georgios Giovanakis, CEO of thyssenkrupp Electrical Steel. Tilo Else, Vice President Procurement Grid Technologies at Siemens Energy, emphasizes: “The fact that we are now using the high-tech powercore® electrical steel in the same quality in a CO₂-reduced version is an important step towards the decarbonization of our entire process chain. The partnership with thyssenkrupp Electrical Steel will be a decisive step forward for us and thus also for our customers in reducing Scope 3 emissions.”

In order to make the energy transition and the decarbonisation of industry in

Europe a success, both companies are urgently calling for the establishment of green lead markets for climate-friendly raw materials. The CO₂ reductions contained in a product must be immediately recognisable to everyone. Uniform rules for CO₂-reduced steel on the basis of

relevant norms and standards are the prerequisite for the transformation of the industry towards climate neutrality.

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GLOBAL STEEL MARKET TRENDS

Short range outlook on steel demand

World Steel Association (worldsteel) has published its steel demand forecast for 2024 and 2025. India has emerged as the strongest driver of growth. Western Europe is currently facing the greatest challenges.

Worldsteel forecasts that this year demand will see a 1.7% rebound to reach 1,793 million t. Steel demand is forecast to grow by 1.2% in 2025 to reach 1,815 million t. Commenting on the outlook, Dr. Martin Theuringer, Chairman of the worldsteel Economics Committee, said: “After two years of negative growth and severe market volatility since the COVID crisis in 2020, we see early signs of global steel demand settling in a growth trajectory in 2024 and 2025. The global economy continues to show resilience despite facing several strong headwinds, the lingering impact from the pandemic and Russia’s invasion of Ukraine, high inflation, high costs and falling household purchasing power, rising geopolitical uncertainties, and forceful monetary tightening. With the end of this monetary tightening cycle approaching, tighter credit conditions and higher costs have led to a sharp slowdown in housing activity in most major markets and have hampered the manufacturing sector globally. While it seems the world economy will experience a soft landing from this cycle, global steel demand growth remains weak and market volatility remains high.”

Breakdown by region

Worldsteel expects that steel demand in **China** in 2024 will remain around the level of 2023, as real estate investments continue to decline, but the corresponding steel demand loss will be offset by growth in steel demand coming from infrastructure investments and manufacturing sectors. In 2025 steel demand in China might be returning to downtrend with a 1% decline.

This projection suggests that by 2025 China’s steel demand will be significantly lower than the recent peak demand year, 2020. This projection is also in line with the view that China might have reached its peak steel demand, and the country’s steel demand is likely to continue to

decline in the medium-term, as China gradually moves away from a real estate and infrastructure investment dependent economic development model. For 2023, apparent steel use estimate for China is based on official statistics and suggests a 3.3% drop.

Worldsteel’s projections for the world excluding China suggest a broad-based growth in steel demand at a relatively strong level of 3.5% per annum over 2024-25. **India** has emerged as the strongest driver of steel demand growth since 2021, and the projections suggest Indian steel demand will continue to charge ahead with 8% growth in its steel demand over 2024 and 2025, driven by continued growth in all steel using sectors and especially by continued strong growth in infrastructure investments. In 2025, steel demand in India is projected to be almost 70 million tonnes higher than in 2020.

Other emerging parts of the world such as **MENA** and **ASEAN** are expected to show accelerating growth in their steel demand over 2024-2025 after a significant slowdown over 2022-2023. Mounting difficulties in the ASEAN region, such as political instability and erosion of competitiveness, might lead to a lower trend steel demand growth going forward.

The developed world is also expected to show a strengthening recovery with 1.3% in 2024 and 2.7% in 2025. Steel demand might finally show a meaningful

pick up in the EU in 2025 and continued resilience in the US, Japan, and Korea. **Western Europe** (the EU and the UK) remains the region currently facing the biggest challenges. The region and in particular its steel using sectors are challenged on a multitude of fronts – geopolitical shifts and uncertainty, high inflation, monetary tightening and partial withdrawal of fiscal support, and still high energy and commodity prices. The persistence of these downside factors resulted in a major drop in the region’s steel demand in 2023 to the lowest level since the year 2000 and to substantial downward revisions of the forecast for this year. After only a technical rebound in 2024, the region’s steel demand is expected to finally show a meaningful recovery with a 5.3% growth in 2025. The forecasted steel demand for the EU in 2024 is only 1.5 million t higher than the pandemic trough in 2020.

In stark contrast with the EU, steel demand in the **United States** continues to show healthy fundamentals. The country’s steel demand is expected to quickly return to growth path in 2024 after a sharp drop led by housing market slowdown in 2023 thanks to strong investment activity, which received a boost from the Inflation Reduction Act and a gradual recovery in housing activity.

World Steel Association (worldsteel)

We see early signs of global steel demand settling in a growth trajectory in 2024 and 2025.

Dr. Martin Theuringer, Chairman of the worldsteel Economics Committee

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02 Raw material pretreatment

02.01 Ore dressing

740 Mixers/core sand mixers



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



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2230 Charging machines (trough and tongs)



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2270 Injection plants for argon



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04.09 Components

2440 Handling equipment for oxygen/carbon lances



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04.09 Components

2490 Coal dust injection lances



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2530 Lance robots/-manipulators



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2580 Oxygen nozzles



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04.09 Components

2600 Oxygen lance equipment



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2655 Fuses (multifunction) for burners



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2660 Special safety oxygen hose reels



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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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5155 Forging manipulators, rail-mounted



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5160 Forging robots



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5180 Transport manipulators



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10 Cold rolling

10.01 Cold rolling mills

5490 Strip, sheet, cold and metal rolling mills



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10.04 Annealing lines

5670 Annealing lines



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11 Surface treatment

11.04 Surface treatment plants

6270 Strip edge trimming



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11.04 Surface treatment plants

6280 Strip processing and finishing lines



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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\O57TIG 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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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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10270 Roller hearth and walking beam furnaces



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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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10570 Heat treatment furnaces for batch operation, open heated



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16.09 Bath furnaces

10580 Aluminum melting furnaces



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16.13 Components

10890 Natural gas burners



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11010 Regenerative burners



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11020 Recuperative burners



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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

13070 Piston pumps



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 Internet: www.hydrowatt.com

18.10 Power and work machines

13160 Vacuum pumps



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21 Measuring and testing technique

16488 Multichannel measuring systems



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 Internet: www.ims-gmbh.de

21.02 Measurement of physical properties

16608 Strip thickness control (AGC)



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 76337 Waldbronn, Germany
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16612 Strip flatness measurement



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21.02 Measurement of physical properties

16652 Dressing degree and mass flow measuring systems



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16660 Thickness measuring systems and devices



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21.02 Measurement of physical properties

16830 Speed measuring devices



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16892 Force measuring systems



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21.02 Measurement of physical properties

16910 Length measuring devices for tubes



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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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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



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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, lickier-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-super alloys
- 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 Slings 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

- 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

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

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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The next issue of STAHL + TECHNIK in German will be out in June covering the following topics:

STEEL TECHNOLOGY

Long-distance transport of sponge iron (DRI)

ArcelorMittal Germany has successfully sent a first test wagon from Hamburg with locally produced sponge iron (DRI: Direct Reduced Iron) for future processing at the Eisenhüttenstadt steelworks some 400 km away. This creates a supply chain at the end of which steel is produced in a carbon neutral manner. The aim was to analyse the options for unloading the DRI at the Eisenhüttenstadt site.

Advanced technology upgrade ensures better rolling stability and high-quality strip production

The technological upgrade of the hot strip mill complex originally supplied to Çolakoğlu Metalurji for its site in Kocaeli (Turkey) was successfully implemented. It has brought significant benefits in terms of rolling stability and high-quality strip production, especially with regard to strip flatness and coil shape, with less maintenance required in the finishing mill.

STEEL DISTRIBUTION

Optimising processes through lean organisation

About five years ago, COGNE Acciai Speciali Spa started to implement process optimisation through lean organisation at its main plant in Italy. By managing stocks and all the steps between the receipt of materials and the completion of orders, lead times have been reduced by 15 per cent and stocks of consumables and spare parts by 22.5 per cent. Since then, the strategy has gradually been implemented at the company's international sites, such as the one near Bremen, Germany, which is currently managing the roll-out across the country.

ECONOMY

Vanadium market expected to double by 2030

Vanadium is an important metal for the steel industry, where it is mainly used as an alloying element. In recent years, however, demand in the battery and aviation sectors has risen rapidly. As a result, global demand for vanadium is expected to grow continuously by more than 8 per cent per year and reach a volume of more than USD 80 billion by 2030. At least that is what analysts are forecasting. Demand from the steel industry, which currently accounts for around 85 per cent of the market, is then likely to fall significantly in favour of the aviation and battery industries.

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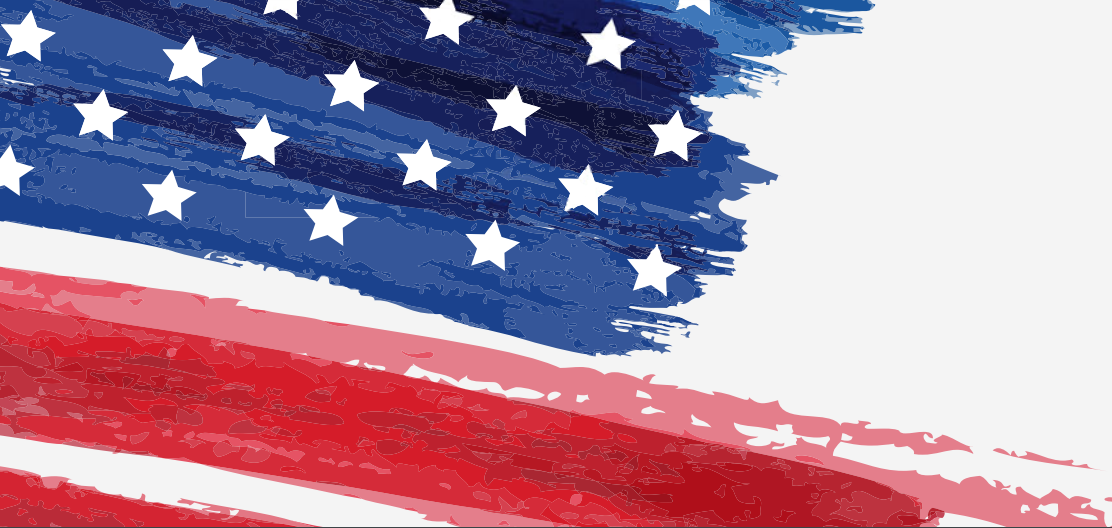
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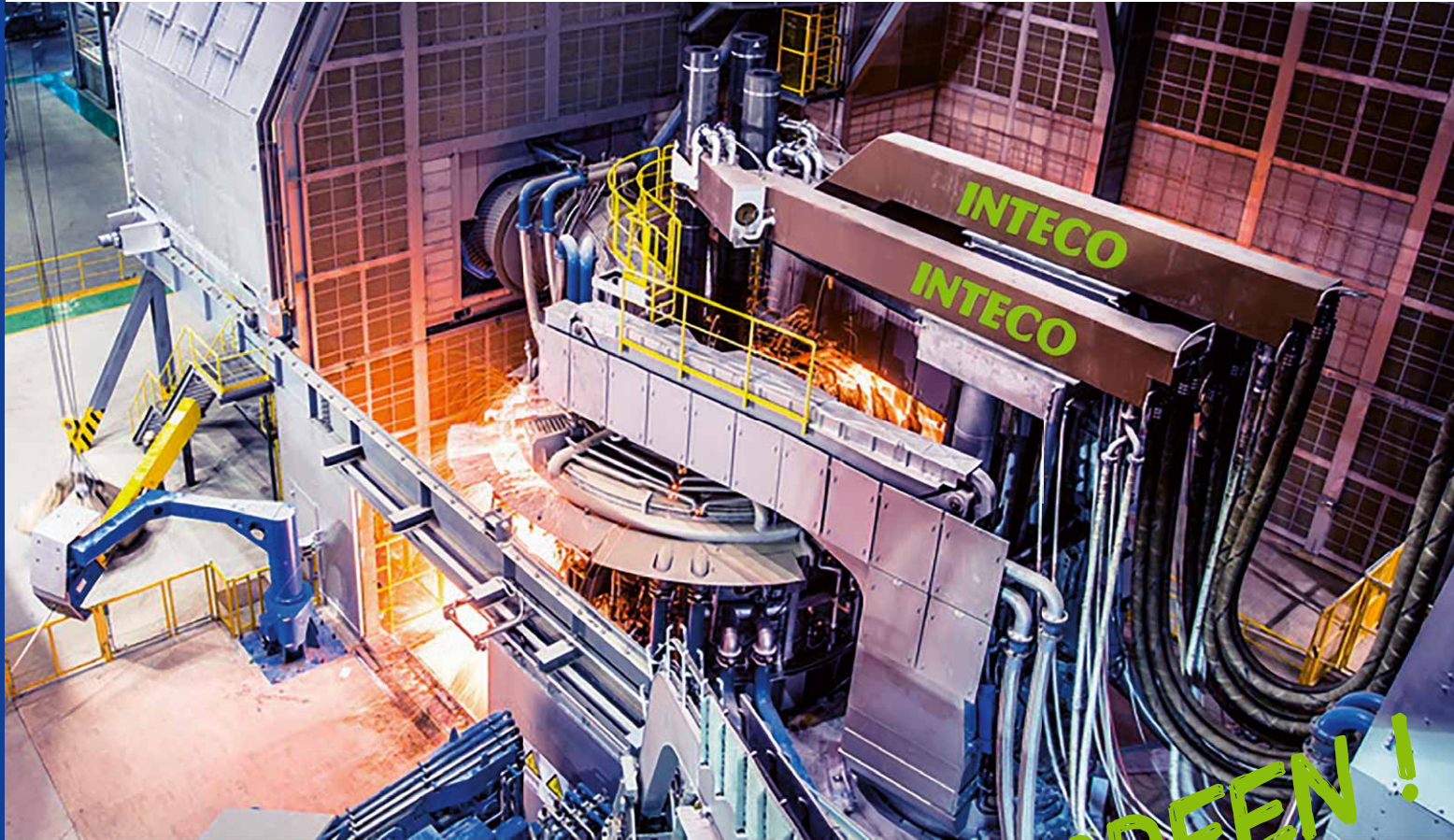
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