Issue December 2024

STEEL+ TECHNOLOGY

04/23

THE TECHNICAL MAGAZINE FOR IRON AND STEEL PROFESSIONALS AROUND THE WORLD

STEELMAKING

Robotic maintenance of the ladle sliding gate to enhance safety and improve reliability

DIGITALISATION

Roll shop management system increases throughput and reduces costs

ECONOMY

World Steel Association forecasts that steel demand will grow by 1.8% in 2023

STEEL PROCESSING

Steel for the monopile foundations of the world's largest offshore wind farm

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At SMS group, we have made it our mission to create a carbon-neutral and sustainable metals industry. We supply the technology to produce and recycle all major metals. This gives us a key role in the transformation towards a green metals industry.

Steel changes colour to green

Arnt Hannewald,
Dipl.-Ing., Editor

The HÜTTENTAG 2023 - steel's annual technology event in the heart of Europe, took place for the fifth time in Essen in November (from **page 28**). The conference and exhibition has developed into a very lively meeting place for the industry, where challenges and solutions are discussed intensively. "This annual conference never fails to be a beacon of innovation and progress in the world of steel and hydrogen (...) Each year this conference becomes a catalyst for positive change", a participant posted on LinkedIn immediately. At this point, a big thank you to all participants, speakers, exhibitors and supporters for this enlightening event! By the way, the next HÜTTENTAG will take place on 19 November 2024.

Some of the key points discussed at the event can be found in this issue. For example digitalisation. First, there is the announcement of a new robotic cell that can support the operator in the maintenance of the ladle sliding gate at steel plants (**page 42**). The automatic solution does not completely replace human intervention but provides support thus enhancing safety and reliability.

Secondly, there is an article on the "digital roll shop", i.e. a new roll shop management system from the German machine tool manufacturer GEORG (**page 48**). In addition to automating and optimising roll shop logistics, the system increases transparency and enables precise control and monitoring of roll shop processes.

The other important issue that we will focus on more in the coming years is sustainable procurement and recycling. Outokumpu will source ferrochrome from a CO_2-neutral chrome mine in Finland (**page 16**). Tata Steel Europe supplies its galvanising lines in the Netherlands with carbon-neutral zinc from Sweden (**page 18**). In the spirit of recycling, steel producers are working together with their own customers to ensure that high-grade scrap from the steel processing industry is returned directly to the steel production process. This close material cycle is beneficial for all parties involved (**page 62**).

I hope you enjoy reading and wish you a peaceful end to the year.

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Outokumpu has started a first-of-its-kind initiative to strengthen the circular economy in Europe 62

STEEL DISTRIBUTION

STEEL PROCESSING

Outokumpu appoints experts to lead feasibility study in the Americas

Outokumpu has appointed two key people to lead the ongoing feasibility study to explore options to increase the company's existing cold-rolling capacity and investigate different options for its hot-rolling arrangements in Calvert, Alabama.

Michael Tecza has been appointed as Project Director. He is joining from Intel and has an extensive background in large capital investment projects across the globe. Prior to Intel, Michael Tecza led several capital investment projects for, for example, BCG and McKinsey. Hugh Embrey has been appointed as Technical Project Director, leading and supervising the technical implementation of Outokumpu's selected equipment. He has an exceptional background in steel-rolling investment projects.

Both Michael Tecza and Hugh Embrey have already started their assignments. They belong to the Group Investment Office organization led by Stefan Erdmann, Chief Technology Officer at Outokumpu.

Leading the feasibility study to explore options for rolling operations in Calvert, Alabama: Michael Tecza, Stefan Erdmann and Hugh Embrey (Picture: Outokumpu)

Outokumpu

Leadership appointments at Steel Dynamics

Steel Dynamics has announced five leadership promotions in different areas of the company. Within the Flat Roll Steel Group, Christopher Graham has been promoted to Senior Vice President. Daniel Keown as been assigned to the positions of Vice President of Steel Dynamics and General Manager Columbus Flat Roll Steel Division. Richard Poinsatte is now Senior Vice President and Treasurer of Steel Dynamics – finance, business development, and risk. Angela Reeve has been appointed as Vice President of Steel Dynamics – Human Resources, and Christopher Gionti as Vice President of Steel Dynamics and General Manager Structural and Rail Steel Division.

Steel Dynamics, Inc.

New CEO at ArcelorMittal Europe – Flat Products

As of February 2024, Reiner Blaschek, CEO of ArcelorMittal Germany, has been appointed as CEO of ArcelorMittal Europe – Flat Products. Reiner Blaschek has been with ArcelorMittal and its predecessor companies since 1995 in various positions, as chairman of the mills in Bremen and Eisenhüttenstadt and, most recently, as CEO ArcelorMittal Germany. Blaschek will succeed Yves Koeberle who will become head of purchasing for the whole of Europe.

ArcelorMittal

Reiner Blaschek, newly appointed CEO of ArcelorMittal Europe – Flat Products. (Picture: ArcelorMittal)

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INDUSTRIAL APPLICATIONS

MARITIME APPLICATIONS

EUROPE – GERMANY

Jacobs to manage construction site organization for decarb project at thyssenkrupp Steel

Jacobs has been selected as Program and Construction Management (PMCM) partner for thyssenkrupp Steel's multi-billion Euro effort to decarbonize its steel works in Duisburg, Germany.

The project encompasses a new process using green hydrogen for iron reduction, replacing traditional coal-powered blast furnaces with hydrogen-powered direct reduction plants and electric smelters. When the first plant goes into operation at the end of 2026, the site will produce 2.5 million metric tons of direct reduced iron (DRI) annually and reduce carbon emissions by up to 3.5 million metric tons per year. "The overall coordination of trades and partners on site is of decisive importance in the construction of direct reduction plants, melters and auxiliary units in order to ensure a smooth process and efficient implementation," said thyssenkrupp Steel Technical Project Leader Direct Reduction Christian Kuhn.

As PMCM partner, Jacobs' scope of work includes overall coordination and management of engineering services, assembly and logistics; construction management and supporting contract management; assembly management of the Engineering Procurement Construction (EPC) contractor for the direct reduction plant; and interface management across the construction and assembly teams.

Steel production at thyssenkrupp Steel Europe is planned to be completely climate-neutral by 2045 at the latest. The decisive step in this direction will be the construction of hydrogen-based direct reduction plants in conjunction with innovative melting units. The first plant is scheduled to go on stream in Duisburg in 2026. Production of five million metric tons of low-CO_2 steel is already planned for 2030.

Jacobs

EUROPE – GERMANY

Salzgitter Group signs long-term purchase agreement for solar power

Salzgitter Flachstahl and Friesen Elektra have signed a long-term purchase agreement (PPA) for power to be sourced from the "Sande Hybrid Energy Park" that is currently being built in the municipality of Friesland in Lower Saxony, Germany, and scheduled to go online at the start of 2024.

As from May 2024, a permanent supply of around 80 MW of green electricity from the new Sande Hybrid Energy Park has been secured under the PPA for Salzgitter Flachstahl. The already existing "Sande Wind Farm" is currently being expanded with the aim of sourcing energy from wind turbines and photovoltaic systems. In the final stage of construction, the Sande Hybrid Energy Park will deliver an overall output in excess of 120 MW.

Sustainably produced energy in the vicinity of Sande will additionally secure the SALCOS® - Salzgitter Low CO_2 Steelmaking transformation program. Green power from the photovoltaic plants is initially an integral component of Salzgitter Flachstahl's regular "power procurement portfolio". The long-term plan aims at harnessing the power for the production of green hydrogen. At the same time, the agreement includes the option of procuring hydrogen produced locally. Green hydrogen is a core component for Salzgitter AG to produce virtually carbon-neutral steel.

"The partnership with Friesen Elektra constitutes another key element of our strategic journey toward producing virtually carbon neutral steel in Salzgitter," says Gunnar Groebler, Chief Executive Officer of Salzgitter AG. "Implementing sustainable steel along with energy production is becoming increasingly important not only for us, but also for our suppliers and customers."

Salzgitter AG / Friesen Elektra

EUROPE – FRANCE

ArcelorMittal Industeel orders vertical slab caster for special steel

Danieli is going to instal a vertical slab caster at ArcelorMittal Industeel's Le Creusot plant. The caster will be used to process special grades ranging from carbon to stainless steels and nickel-based alloys.

The new machine will be the first slab caster at the Le Creusot plant. It is a strategic investment, partially replacing ingot casting. The caster will help reduce transformation losses, reduce the number of rolling passes, improve quality and yield, and reduce energy consumption and CO_2 emissions.

It will feature a wide selection of Danieli 3Q technological packages, such as real-time quality assessment, mould breakout prevention system, advanced mould level control, mould hydraulic oscillator control and dynamic cooling control. Dynamic soft reduction, mushy zone detection and liquid pool length detection are further quality-enhancing features of the machine. It will produce quality slabs in thicknesses of up to 150 mm, widths from 1,500 to 2,100 mm and lengths between 4 and 6 m. Electrics and the process automation system will be provided by Danieli Automation. Plant startup is scheduled by May 2025.

Danieli

EUROPE - GREENLAND

Outokumpu interested to support the climate-friendly Malmbjerg molybdenum project

Outokumpu has been exploring opportunities to secure sustainable molybdenum supplies from western suppliers – as a part of its long-term strategy for value-chain integration.

The company has therefore signed a letter of intent with Greenland Resources Inc., a Canadian mining company developing the Malmbjerg molybdenum project in east Greenland. Greenland Resources has completed a definitive feasibility study and is currently negotiating capex funding to build the mine. The letter of intent allows the companies to continue negotiations on further detailed cooperation.

The Malmbjerg molybdenum project is an open-pit molybdenum mine that could supply around 25% of the European molybdenum demand. The project would have a low footprint due to modularized infrastructure, low CO_2 emissions, low aquatic disturbance and clean contained tailings. The transport of 35,000 tonnes of ore per day would use a gravity based aerial rope conveyor that requires no energy and therefore causes no carbon emissions and generates electricity from braking.

Molybdenum is a critical and strategically important raw material for stainless steel production. Europe is the second largest molybdenum user worldwide and so far, has no production of its own.

Outokumpu Group

EUROPE – HUNGARY

Dunaferr to transition from coal- to EAF-based steel making

Liberty Steel UK, which has received approval for the acquisition of ISD Dunaferr by the European commission, has formed a partnership with China's CISDI Engineering Co. to prepare for the decarbonisation of the Dunaferr steel works.

In collaboration with the Hungarian Ministry of Economic Development, Liberty and CISDI will develop and implement a decarbonisation pathway which will see the Dunaferr plant shift from coal-based steel making to electric arc furnace technology, and in doing so reduce direct CO_2 emissions by approximately 80 percent.

The plans, which have meanwhile been approved by the European Commission under the EU Merger Regulation, will see the installation of a new 150 t capacity electric arc furnace to be supplied by CISDI. Liberty and CISDI will bear the primary responsibility for the technical aspects of the project, including design, engineering, procurement of equipment, and technology services. The Hungarian Ministry for Economic Development will explore how it can support the project, including exploring how to facilitate any required administrative processes for the establishment of the EAF facility.

Liberty Steel

EUROPE - ITALY

Acciaierie Venete to expand in the area of wire rod products

Acciaierie Venete, a steelmaker specialized in high added-value long products and operating various facilities in Northern Italy, has contracted Danieli to implement a new complete wirerod production line aimed at expanding the existing steel plant in Sarezzo (Brescia).

Fed by the existing bar mill, the new wirerod line will produce special steel smooth rounds from dia. 5.5 to 25 mm, at speeds up to 110 m/s, expanding the company product portfolio.

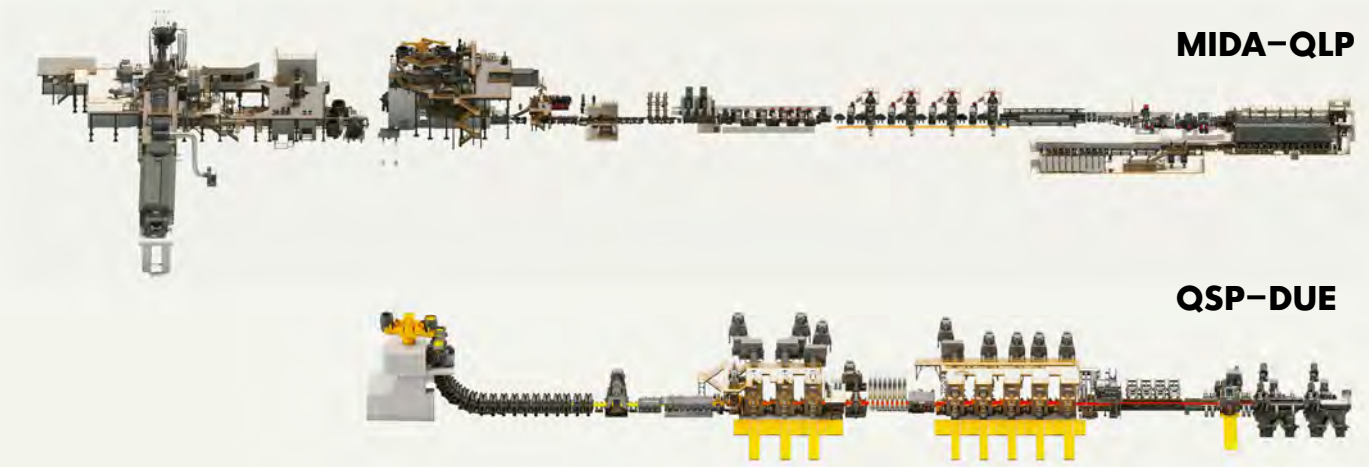
The new wirerod mill will include three fast-finishing blocks to perform a total of 18 passes, including one TMB Twin-Module Block which will guarantee ± 0.1 mm tolerance and 50% ovality to the whole range of products.

Danieli Automation Hi-Profile Lite gauge measurement system will provide real-time feedback on the rolling operations and certify the quality of the final product, whilst motorized remote control of the rings will allow prompt adjustments during rolling.

Remote diagnostics of the main equipment will be made available through the Danieli CMS Conditioning and Monitoring System. The new line will be designed with the provision of in-line low-temperature rolling for specific final applications.

The contract includes engineering, manufacturing, erection, on-site training, and advisory services for the complete technological supply. The mill will start operation in early 2025.

Danieli



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GIANPIETRO BENEDETTI
CHAIRMAN OF THE BOARD OF DIRECTORS

EUROPE - ITALY

Pilot plant for green steelmaking at RINA CSM

RINA has announced the commencement of the six-year Hydra project to build a 100% hydrogen-fuelled pilot plant comprising direct reduction, steelmaking and reheating facilities.

To be built and operated by RINA's Centro Sviluppo Materiali (CSM) in Castel Romano, the future hydrogen-fuelled pilot plant will comprise

- a direct reduction (DRI) plant,
- an electric arc furnace (EAF) and
- a reheating furnace,

that will all operate with near zero emissions for the production of all types of 'green steel'.

The 30-metres tall DRI tower, which reduces iron ore into metallic iron (DRI), will initially run on natural gas. The project team will then assess production using a gas mixture with increasing levels of hydrogen and, ultimately, 100% hydrogen. The testing results will establish the quality of steel produced using hydrogen as the reducing agent in the DRI tower with the EAF and characterise the material and infrastructure needed for the steel industry to use this gas in production.

The construction of the plant is scheduled for completion by 2025. When fully operational, it will produce up to 7 t of steel per hour for research. The project team, including up to 120 engineers, will further evaluate the effects of different mixes of raw materials using metallic iron from the DRI tower and steel scraps within the process.

The Hydra project is funded by the European Commission's NextGenerationEU plan and backed by the Italian Ministry of Enterprises and Made in Italy through RINA's Centro Sviluppo Materiali (CSM) in Castel Romano (Italy). The EUR 88 million R&D Hydra project is part of the IPCEI (Important Projects of Common European Interest). The Hydra project has been supported since its inception by leading European steel producers, plant suppliers, utilities, and major stakeholders in the sector.

RINA

EUROPE – PORTUGAL

Lusosider to upgrade pickling line

Lusosider Aços Planos S.A, part of Brazilian CSN Group, has selected Danieli Service to upgrade the payoff reel in its pickling line No.2 at Aldeia de Paio Pires.

The project will consist of replacing the existing mandrel – complete with main gears and main bearings – with new, tailor-designed equipment. The order for Danieli also includes on-site advisory services for installation and commissioning. The new mandrel will precede the supply of a new outboard bearing to limit the current mandrel deflection under coil load and strip tension. This will improve strip centering and strip flatness, hence the quality of the final product. The new equipment will be installed in autumn 2024.

Danieli

EUROPE – SPAIN

Hyperion Materials & Technologies expands carbide facility

Hyperion Materials & Technologies has inaugurated its newest production facility for cemented carbide base materials and components in Martorelles near Barcelona.

Hyperion Materials & Technologies, headquartered in Worthington, Ohio, USA, is a materials science company that develops advanced hard and super-hard materials for a variety of industries and applications. The expansion of its existing carbide sintering plant in Martorelles will increase the site's production capacity of cemented carbide base materials and components by 60 percent to more than 500 t/year. The Martorelles site is also home to Hyperion's carbide research and development team focused on materials science and continuous innovation.

The project, which began construction in July 2022 and increased the site's size from 11,650 square meters to 16,900 square meters, expanded the production space for the manufacturing of can tooling systems, wire drawing dies and wear components. The project, funded in part by the Catalan Institute of Finance (ICF) of the Generalitat de Catalunya (Catalan Government), also created the production capability to manufacture all of Hyperion's tungsten carbide rolls supplied to the steel industry for manufacturing long steel products through the hot rolling process.

Hyperion Materials & Technologies

EUROPE – TURKEY

Hasçelik orders technology for new steelmaking plant

Special steel producer Hasçelik Sanayi ve Ticaret A.S. is going to build a new steel plant in Osmaneli (Bilecik). The equipment for the new mill will be provided by ABB in partnership with Tenova.

The new line will comprise a Consteel® electric arc furnace equipped with a Consteerrer® electromagnetic liquid steel stirring system, a ladle furnace and a twin vacuum degasser. All units will be linked and controlled by an extensive, state-of-the-art automation system to optimize the whole process and guarantee high quality steel grades.

Consteerrer® is a technology jointly developed by ABB and Tenova as part of an exclusive global partnership agreement. It is based on ABB's ArcSave® non-contact electromagnetic stirring technology designed specifically for continuous charging EAFs. The furnace selected by Hasçelik will be the first continuously charged EAF in Turkey. Continuous charging makes the process robust to variations in scrap quality and density, and the content of volatile compounds.

ABB / Tenova

EUROPE – UNITED KINGDOM

British Steel unveils detailed proposal to decarbonise its operations with two new EAFs

The Chinese-owned steelmaker unveiled ambitious plans for the biggest transformation in its history – a £1.25-billion proposal to become a clean, green and sustainable business by adopting electric arc furnace steelmaking.

The proposals, which are subject to appropriate support from the UK Government, could see British Steel install two electric arc furnaces (EAFs) – the first at its headquarters in Scunthorpe, the second at its manufacturing site in Teesside. The new furnaces could be operational by late 2025 and would replace the aging iron and steelmaking operations in Scunthorpe which are responsible for the vast majority of the company's CO_2 emissions. The company proposes maintaining current operations until a transition to electric arc steelmaking.

British Steel has started preliminary talks with trade unions about electrification, and has promised to support employees affected by the decarbonisation plans. It has agreed for its proposals to be reviewed by an external specialist on behalf of the trade unions.

The company is also working with North Lincolnshire Council on a masterplan to attract new businesses and jobs to the Scunthorpe site, parts of which could become vacant if the proposals go ahead.

British Steel CEO and President, Xijun Cao, said: "Decarbonisation is a major challenge for our business. We have engaged extensively with the public and private sector to understand the feasibility of producing net zero steel with our current blast furnace operations. However, thorough analysis shows this is not viable. Our owners, Jingye, have already invested £330 million in British Steel in just 3 years and they're committed to the unprecedented investment our proposals require."

British Steel unveiled its Low-Carbon Roadmap in October 2021, pledging to invest in a range of technologies to deliver net-zero steel by 2050, and significantly reduce its CO_2 intensity by 2030 and 2035. However, the company is now proposing to accelerate its decarbonisation journey with the potential new operating structure able to reduce its CO_2 intensity by around 75 per cent.

British Steel

EUROPE – POLAND

CMC Poland to modernize bar mill

CMC Poland has selected Danieli Automation to revamp its 500,000 t/year bar rolling mill in Zawiercie by the end of this year.

The revamping project is aimed to optimize rolling performance and increase plant availability. New, low-voltage inverter drives for the mill's roughing and intermediate sections will be installed to improve operation and plant maintainability. A focus will be the reheating furnace to ensure that the billets produced by the local meltshop are precisely heated to the appropriate rolling temperatures. To this purpose, hardware components and the software for the Level 1 automation system will be upgraded. A new process control system for the automatic set-up of the furnace heating curves will also be part of the supply.

Danieli Automation will upgrade the Zawiercie bar mill of CMC Poland (Photo: Danieli)

Danieli

EUROPE – SWEDEN

Outokumpu to reduce direct emissions with biomass-based raw material

Outokumpu has signed an agreement to become a shareholder in Envigas AB, a leading European producer of biochar with an ownership share of 20%.

With a production plant based in Skellefteå, Sweden, Envigas AB is the first large-scale producer of high quality biocarbon in the Nordics with a sharp focus on products for the steel industry to help in the shift towards zero emissions. Biocarbon, also called biochar, is a raw material produced using biomass from forest and wood industry side streams. Biocarbon can be used as such or further processed into biocoke (i.e., densified biocarbon) and it is used to replace fossil coke in ferrochrome smelting and fossil coal in stainless steel melting respectively.

Envigas aims to expand their production capacity by 25,000 tonnes in the first scale up phase by end of 2026 and Outokumpu has agreed to invest EUR 9.9 million into the company. With the investment, Outokumpu secures a right to 50% of Envigas' production. Parallel to this transaction, Outokumpu continues to work on a feasibility study regarding a possible investment into a biocoke production facility of its own in the future.

Outokumpu's climate target is to reduce carbon dioxide emissions by 42% by 2030 from the base year of 2016, in accordance with the Science-Based Targets initiative's 1.5 degree climate target.

Outokumpu

EUROPE - SWEDEN

Ovako invests in vacuum tank degassing facility

Ovako, owned by Sanyo Special Steel and Nippon Steel Corporation, is investing in a new vacuum tank degassing facility at its Hofors mill.

The investment comprises two key components: a state-of-the-art degassing facility and mechanical vacuum pumps to enable in-house vacuum generation. The new vacuum tank degassing facility is set to further modernize operations in Hofors. It will not only enhance the product quality, but also further improve the steel mill´s overall performance. Replacing steam jet pumps with mechanical pumps will reduce energy consumption and CO_2 emissions and improve overall efficiency. The facility is scheduled to be fully operational by late 2024 or early 2025.

Ovako

EUROPE – UNITED KINGDOM

Agreement between Tata Steel and the UK Government lays decarbonisation pathway for steelmaking in Port Talbot

Tata Steel and the UK Government have announced a joint agreement on a proposal to invest in state-of-the-art electric arc furnace steelmaking at the Port Talbot site with a capital cost of £1.25 billion inclusive of a grant from the UK Government of up to £500 million.

Tata Steel will work to finalise the terms of the grant funding agreement with the UK Government and engage with the Welsh Government to seek requisite approvals and permits for the proposed project. The company will soon commence consultation on the proposal and the transition period including potential deep restructuring for the carbon-intensive, unsustainable iron and steelmaking facilities at Port Talbot, where many of the existing 'heavy end' assets —such as blast furnaces and coke ovens—are reaching the end of their operational life.

The proposed project would ensure continuity of steel making in Port Talbot after the transition, and transform Tata Steel UK into a sustainable, capital-efficient and profitable business. With UK Government support, the project has a robust investment case.

Further to the investment proposal, as part of Tata Steel's commitment to advance global research and innovation in materials science for a sustainable future, the company intends to invest approximately £20 million over four years to set up two additional Centres of Innovation and Technology in the UK at the Henry Royce Institute at Manchester (for advanced materials research) and at Imperial College London (for research in sustainable design and manufacturing).

During the transition period and project phase, Tata Steel UK will work intensively to ensure uninterrupted and reliable supply of products to fulfil customer and market commitments, including through the import of additional steel substrate from stable supply chains to feed its downstream units.

Tata Steel

RAW MATERIALS

Chrome mine to become CO_2-neutral

Outokumpu, the global leader in sustainable stainless steel, is accelerating the green transition. As part of emission reduction targets, the company's Kemi mine will become carbon neutral by 2025. Almost a third of the target is to be achieved with renewable fuels.

The Kemi mine is the only chrome mine in the European Union and part of the sustainable supply chain of Outokumpu's stainless steel mill in Tornio (Picture: Outokumpu)

This decade is highly critical in terms of climate action, and Finland plays an important role as the frontrunner in Europe. Outokumpu will take a significant step forward in reaching its own climate target by replacing fossil fuels with renewable solutions provided by Neste, the world's leading producer of renewable diesel. With renewable fuels, the annual greenhouse gas emissions of the Kemi mine will be cut by almost 11.3 million kilos, which corresponds to the removal of approximately 4,000 passenger cars from Finnish traffic for a year.

"As the only stainless steel producer, Outokumpu is committed to ambitious climate targets in line with the 1.5 degree ambition. We aim to decrease direct and indirect emissions as well as emissions from the supply chain by 42% per tonne of stainless steel we produce by 2030 compared to the 2016 baseline. The carbon neutrality of the Kemi mine is an investment worth millions of euros and when realized, it will mean a reduction of almost 40 million kilos in Outokumpu's greenhouse gas emissions. The three key factors of the Kemi Mine's carbon neutrality are giving up fossil fuels, utilizing low-emission electricity, and replacing natural and propane gas in heating. As a first step, we switch to renewable fuels and aim to identify all possibilities to decrease emissions from the entire value chain – to get as close to zero in our total emissions as possible. We are also studying the opportunities for compensating the remaining emissions in our value chain that cannot be otherwise reduced with current technology. Our goal is to make the Kemi mine the world's first operating carbon-neutral mine by 2025,"

says Heidi Peltonen, Vice President Sustainability at Outokumpu.

The Kemi mine is the only chrome mine in the European Union and part of the sustainable supply chain of Outokumpu's stainless steel mill in Tornio. Outokumpu's operations in Kemi and Tornio also provide a great number of jobs in Finland.

"Our own chrome mine is a competitive advantage. As part of the development of the Kemi mine and achieving our sustainability targets, we have recently finished a significant mine project. In 2017–2023, we invested more than EUR 280 million into deepening our underground mine from 500 meters to 1,000 meters. This is to ensure the continuous supply of chrome, a key raw material in stainless steel, for decades to come. The carbon footprint of the ferrochrome produced by our company is 67% lower than the industry average, which in part has an impact on our stainless steel having the smallest carbon footprint in the market," says Martti Sassi, President of the business area Ferrochrome at Outokumpu.

Renewable fuels supporting the green transition

Neste's renewable diesel, made from 100% renewable raw materials such as used cooking oil and animal fat from food industry waste is used to replace fossil fuels in the machines, trains and alternative power sources in the Kemi mine and the Tornio mill as well as in the transports between the mine and the mill. The own fleet of the Kemi and Tornio operations as well as contractor fleet will fully switch to Neste MY Renewable Diesel™.

"Our goal at Neste is to help customers reduce their greenhouse gas emissions with our renewable and circular solutions by at least 20 million tons per year by 2030. I'm glad that our long-term cooperation with Outokumpu continues and that we can support the company in working towards its ambitious climate targets. The switch to renewable fuels at the Kemi mine and Tornio steel mill is Neste's most extensive cooperation with the mining and steel industry in Europe so far. By replacing fossil fuels with our renewable fuels in their own fleet and contractors' fleet, Outokumpu can immediately reduce greenhouse gas emissions in these by 90%* on average over the life cycle of the fuel," says Joni Pihlstöm, Vice President, Marketing & Services, B2B Sales at Neste.

**) Over the life cycle of the fuel when compared to fossil fuel. The method used to calculate life cycle emissions and emission reduction complies with the EU Renewable Energy Directive II (2018/2001/EU).*

Continuous strip galvanizing line at the IJmuiden works, Tata Steel Nederland (Picture: Tata Steel)

RAW MATERIALS

Low-carbon zinc from for climate friendly galvanizing lines at Tata Steel

Tata Steel Nederland has signed an agreement with the Swedish metal company Boliden for the procurement of zinc with one of the lowest CO_2 footprints of any refined zinc in the world. The deal covers a significant part of the steel manufacturer's zinc needs and enables its customers, such as carmakers, to make more sustainable choices by using steel products with a lower environmental impact.

Tata Steel makes steel production more sustainable by sourcing low-CO_2 zinc from Sweden. "Our agreement with Boliden reduces our indirect CO_2 emissions and marks a new step in our sustainability journey," said Willem Vermeulen, Chief Procurement Officer of Tata Steel Nederland. "We are committed to making our steel production more sustainable and meeting the evolving needs of our customers – who are increasingly taking into account the environmental impact of the entire value chain – and society at large. With the alignment of our strategies, we will increasingly consider the environmental performance of our suppliers in our decision-making."

Zinc is a crucial raw material to produce galvanised steel, steel that is coated with a layer of zinc to protect it from rusting. The zinc acts as a protective barrier, making the steel more resistant to environmental conditions and extending its lifespan. Galvanised steel combines the strength and versatility of steel with the rust resistance of zinc. It is used in a wide range of industries. For example, in the manufacture of car bodies and other automotive parts, roof structures, solar panel frames and washing machines.

Boliden's low-carbon zinc is mined in the company's own mines, without using fossil energy. According to Boliden, the supplied zinc accounts for an emission of less than 1 tonne of CO_2 per tonne of zinc, compared to the industry average of 3.6 tonnes. This gives it one of the lowest CO_2 footprints of any refined zinc in the world. (The emission calculations include emissions along the entire value chain up to Tata Steel according to Scope 1, 2 and 3 GHG Protocol Product Life Cycle and follow the standard ISO 14064-3.)

"We encourage our suppliers, our customers, and our customers' customers to take part in the industry transition and share knowledge on how we minimise emissions and carbon footprints. Our Green Transition Metals portfolio represents some of the most sustainable options on the market, and by using our low-carbon zinc, Tata Steel shows the importance of reducing emissions at every step of the value chain. This collaboration illustrates how choosing currently available low-carbon materials can immediately reduce carbon footprints," said Sven Hjelmstedt, Director Sales, Boliden.

> We will increasingly consider the environmental performance of our suppliers in our decision-making.
>
> *Willem Vermeulen, Chief Procurement Officer of Tata Steel Nederland*

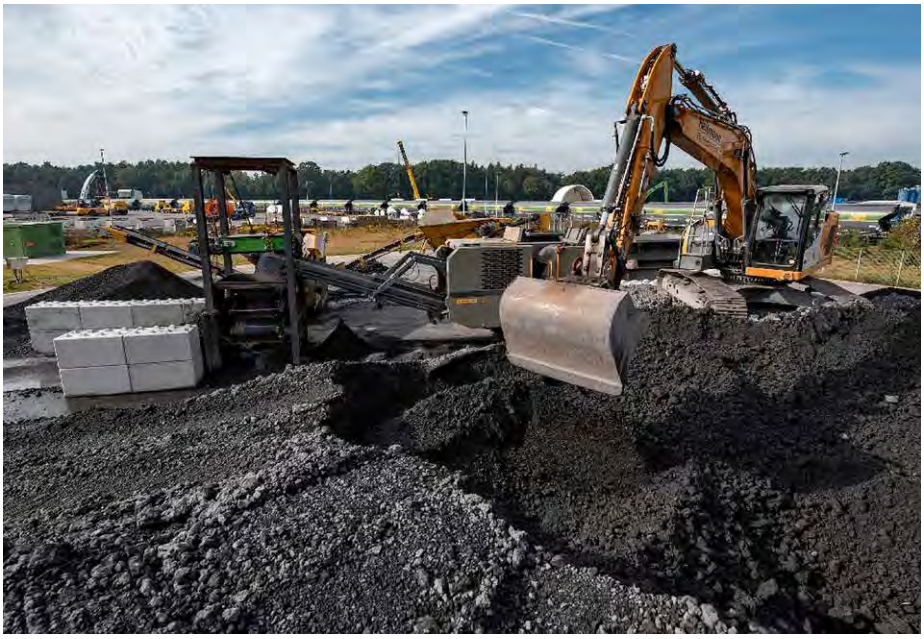
Tata Steel Nederland is committed to reducing its CO_2 emissions with 35-40% by 2030 and being CO_2 neutral by 2045. Meanwhile, the company is not sitting idle, aiming to reduce its annual CO_2 emissions by 500,000 t before the first green steel plants come on stream, and is taking steps to further reduce the impact of its IJmuiden operations on its neighbours and environment. Apart from using virgin zinc from mines Tata Steel also uses recycled zinc in its production. Using circular zinc in combination with zinc from mines increases environmental benefits on top of the low-CO_2 emission zinc acquired from Boliden.

Tata Steel Nederland

EVEN MORE RECYCLING

In-house processing of EAF slag

German Georgsmarienhütte GmbH has commissioned a new slag processing site of approx. 4.6 hectares. The move is part of the company's goal to put the by-products from steel production to further, sustainable use.



Slag is mainly used in road construction substituting natural rock materials
(Picture: GMH group)

Based in the German town Georgsmarienhütte (in the state Lower Saxony), Georgsmarienhütte GmbH is a leading European supplier of crude steel long products – quality and engineering steels, i.e. hot-rolled bars and bright bars. In addition, the company supplies machined and ready-to-install components. The electric steel mill is the largest production site of the GMH group.

Besides the steel bars and components Georgsmarienhütte GmbH produces 90,000 to 120,000 tonnes of electric arc furnace slag annually during steel production. To make further use of this by-product as a recyclable material, the company has now commissioned one of the most modern slag processing facilities in Europe in Spelle-Venhaus at the inland port on Dortmund-Ems Canal. On an area of currently 2.3 hectares – expandable to up to 4.6 hectares – up to 1,000 tonnes of EAF slag can be processed daily for further use.

"We chose the site at the port of Spelle-Venhaus because we have sufficient space here and good transport links," explains Marc-Oliver Arnold, Plant Director at Georgsmarienhütte GmbH. "The slag can be transported here by truck and later, if possible, also by rail. After processing, transport by barge is then also possible."

Upon delivery, the coarse raw slag material is first crushed and then classified into different grain sizes with the help of various processing systems, such as jaw crushers, impact mills and multi-stage screening plants. At the same time, steel that is still in the material is sorted out via various stages with magnets. This material goes back into the various steelmaking processes as scrap. The processed slag is mainly used as a carrier material in road construction. This saves resources because the slag replaces natural rock materials that would otherwise have had to be mined elsewhere.

The operation of the site, and the storage of slag material, was approved by the relevant authorities in accordance with Germany's Federal Emissions Control Act. Various measures have been taken to ensure that the legal requirements are met and, for the most part, significantly exceeded. For example, all rainwater that cannot drain away naturally is collected on the paved areas and purified by a special filter system. Water sprinklers also minimise the spread of dust. In addition, high, soundproof walls protect the distant neighbourhood from noise emissions.

GMH group

> We chose the site at the port of Spelle-Venhaus because of the excellent transport links: by truck, rail and inland waterway.
>
> *Marc-Oliver Arnold, Plant Director at Georgsmarienhütte GmbH*

ORDER BOOK WELL FILLED

Exceptional good business year for Danieli

For Danieli Group, the 2022/2023 tax year ended on 30 June 2023 with a net profit of 243,6 million euro and a gross operating margin (EBITDA) of 423,9 million euro, an 18% improvement over last year, with interesting profitability in relation to sales for both the plant making and steel making sectors, which are showing good sales and margins able to ensure full financial coverage for the investments that were made and the huge expenditures in research and development incurred during the year.

The steel market trend in the last two to three years resulted in positive balance sheets for the steelmaking industry. Hence, there has been an increase in investments aimed at improving product competitiveness and quality, and to reduce carbon emissions. As a consequence, Danieli Group is satisfied with the plant making order backlog both in terms of quantity and quality (gross operating margin). The upcycle of the steel market has contributed to the achievement of positive financial results also for ABS, producing specialty steel long products.

Plant making revenues are higher than the forecasts made at the beginning of the year and are the result of on-time construction schedules contractually agreed with customers, with an EBITDA of 253,0 million euro, up from 2021/2022, even though extraordinary expenses were sustained in the period due to increased transportation costs and the suspension of some projects in Russia and Ukraine.

"Danieli's innovative technologies such as the Digimelter, which will gradually replace the existing technology used on traditional electric furnaces, and Direct Rolling (DUE and MI.DA.), are achieving growing success on international markets so much that our competitors have abandoned their technologies to copy ours," said Gianpietro Benedetti, Chairman of the Board of Directors.

Steel making (ABS Group) products sold in the year reached about 1.25 million tons (10% less than last year), with the goal of increasing these volumes in the next tax year by bringing ABS Sisak in Croatia and the new wire rod and ball mills at ABS S.p.A. to maximum production capacity.

For the 2022/2023 tax year, therefore, consolidated operating profitability (EBIT) is on the rise compared to last year, albeit with some penalties for one-off negative factors tied to prudential write-downs tied to the Group's exit from the Russian market.

On June 30, 2023, the Danieli Group employed 9.732 people – 1.541 in the steel making segment and 8.191 in the plant making segment, an increase of 637 over the figure of 9.095 employees for the year ended June 30, 2022.

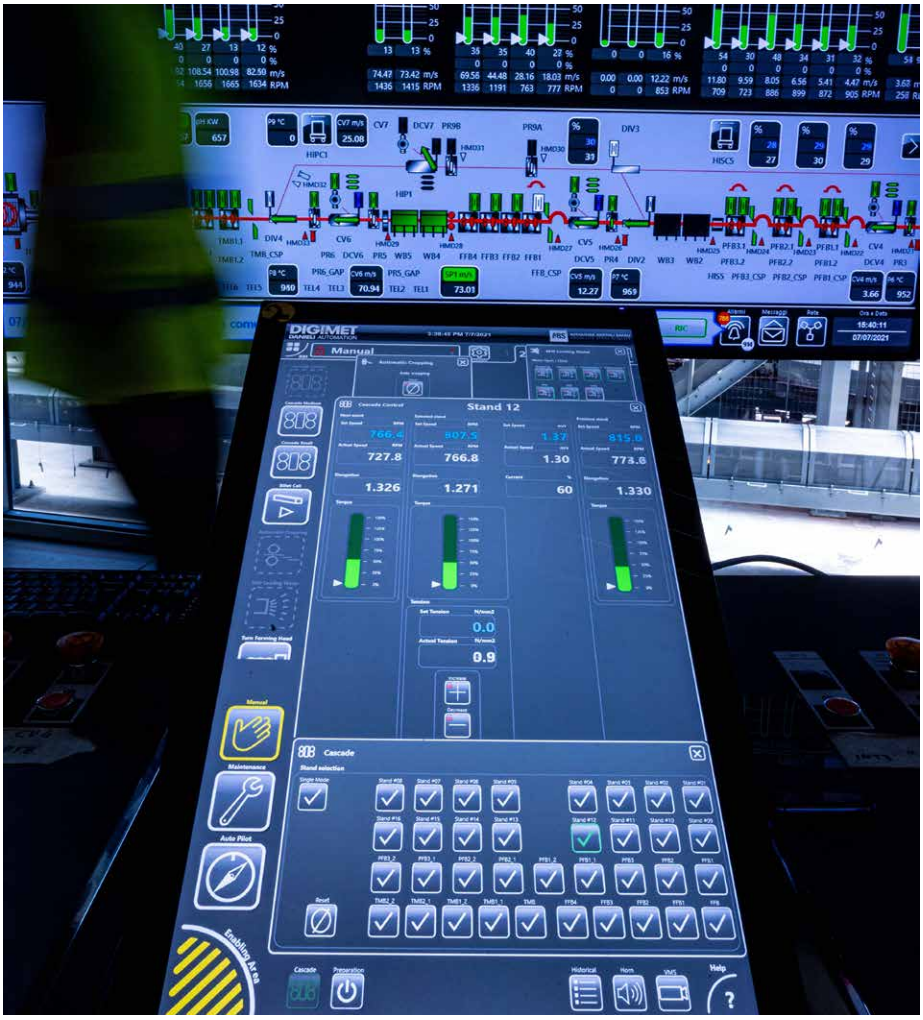
Table 1. Results of the fiscal year 2022/2023 and forecast

	2022/2023	2023/2024
(million €)	Group results	Group forecast
Revenues	4,102	4,000 - 4,300
EBITDA	424	400 - 430
Order book	6,200	6,000 - 6,500

Positive outlook

The performance of both the plant making (plant engineering and manufacturing) and steel making (production of special steels) segments and the good level of orders in the order book are such that for the next fiscal year Danieli can predict that results

> With the Energiron direct reduction process technology, we have had and will have excellent opportunities for projects aimed at replacing existing coal-based blast furnaces.
>
> *Gianpietro Benedetti, Chairman of the Board of Directors at Danieli*



In terms of innovation, Danieli will continue with necessary investments to advance the digitalisation of steel production plants (Picture: Danieli)

will be positive and better than in 2022/2023. For the Plant Making segment, the company expects a better operating result in 2023/2024, with higher volumes and improved margins, including in the order book, equally distributed among the principal product lines (direct reduction plants, steelmaking shops, long and flat products) and evenly distributed among all the geographical areas where Danieli has projects, and a better contribution to the Group's operating profitability by the parent company Danieli & C Officine Meccaniche S.p.A. In addition to the investments that were made in order to rationalize, innovate and make steel production more efficient and modern on a global scale, 2023 also saw the start of a new specific investment cycle in the metallurgical sector, which will bring Danieli some major orders to implement decarbonization in their customers' steelmaking facilities in Europe. In fact, steelmaking is among the hard-to-abate sectors, and thanks to the new hydrogen-based plants that will replace the coal-based ones, GHG can be reduced to almost net zero by using the green technologies from Danieli.

On the other hand, production volumes in the steel making segment are expected to grow in 2023/2024, with greater efficiency of manufacturing processes since we have at our disposal three vertical integration rolling mills: bars, wire rod and balls, and with improved operation of ABS Sisak, even if the energy variable could negatively affect both volumes and margins of production. These plants are part of ABS' "Vision 2.3" program, whereby the company plans to invest more than 700 million euro in the new Digimelter furnaces in order to reach a production volume of about 2 million tons, making it the only steelmaking plant to produce quality steels in diameters ranging from 5.5 to 500 mm on a single site, with all the savings in Op-Ex and logistics that this involves.

Order book and business forecast

The Group's order book is well diversified according to geographical area and product line, and for the year ended June 30, 2023, amounts to 6.200 million euro (of which 369 million euro in the production of special steels) compared to 5.052 million euro for the year ended June 30, 2022 (of which 430 million euro for ABS Steel Making).

The Danieli Group condemns Russia's aggression of Ukraine, which has led to a conflict in Europe with serious consequences in terms of destruction, loss of human life and economic losses, and we hope that mediation talks can begin to put an end to the military action. Right from the start of hostilities, the parent company Danieli & C. began an in-depth analysis of the order book: in the Plant Making segment, there are currently no ongoing projects of significant value in Ukraine whereas all the projects with Russian customers in progress up to June 30, 2023, either experienced serious delays or were terminated due to force majeure. Consequently, the order book no longer includes any amounts for projects in Russia given the low probability of their being developed in the future. The Danieli Group feels it has adequately covered, through a contingency fund, the huge amount of extraordinary charges connected with the closing of projects still under way.

Based on these considerations and prospects, the goals of the Danieli Group for fiscal 2023/2024 are:

- a turnover of 4,000-4,300 million euro,
- EBITDA of 400-430 million euro,
- net cash of 1,400-1,600 million euro,
- order book of 6,000-6,500 million euro.

Gianpietro Benedetti, Chairman of Danieli's Board of Directors and CEO confirms the company's commitment to increasingly promote its role of corporate responsibility towards the global community, not only through direct action but also indirectly with its products, by promoting the research and development of steelmaking equipment and machines that use green steel and sustainable steel solutions, improving efficiency and safety, as well as reducing waste and the impact of GHG to better protect the environment.

Danieli

MERGERS & ACQUISITIONS

Primetals Technologies expands its portfolio with torch-cutting solutions

The acquirement of the TCT assets allows Primetals Technologies to fully integrate torch-cutting technologies into not only the continuous casting segment but also into the wider range of automation solutions for casting and a comprehensive scope of metallurgical services. Steel producers in need of spare parts and maintenance-related expertise will benefit from Primetals Technologies' worldwide network of service centers.

In August 2023, Primetals Technologies acquired the cutting technology assets from Spanish company TCT Torch-Cutting Technologies and signed key personnel to a long-term service contract in order to expand its competences with inhouse torch-cutting expertise. TCT was founded in 2009 and offers a wide spectrum of innovative solutions for all kinds of cutting applications in steel plants, rolling mills, forging shops, foundries, and scrap yards.

Acquiring the technology assets and having torch-cutting experts inhouse will allow Primetals Technologies to expand its competences, which will be particularly useful for new, demanding projects. This step completes the strong and steady relationship between Primetals Technologies and TCT for leading cutting technology solutions.

Developing new technologies

"This integration is an additional means of boosting the development of new solutions while maintaining our high quality standards," says Harald Trost, General Sales Manager of TCT. Resources for the further development of scrap-cutting technologies are freed up as the project execution of TCT is integrated into Primetals Technologies. The transition to green steel production results in the increased use of electric steelmaking plants in which steel scrap is melted. Therefore, the need for effective and innovative systems for scrap management, including new solutions for more environmentally friendly scrap-cutting plants, is increasing.

"With the acquisition of TCT's cutting technologies and the support from key TCT personnel through a long-term service contract, we have established a solid basis for mutually maintaining and developing Primetals Technologies' reliable and high-performing cutting technologies within various fields," says Thomas Brunner, Senior Vice President and Commercial Head of Casting & ESP at Primetals Technologies. "Furthermore, TCT and Primetals Technologies are the perfect partners as we share the same purpose, and we love what we do – it is our passion."

Primetals Technologies

From left: Holger Schmidt, Thomas Brunner, Michael Stiftinger, all with Primetals Technologies, Robert Fries, Harald Trost (TCT), and Andreas Weinhengst (Primetals Technologies) (Picture: Primetals Technologies)

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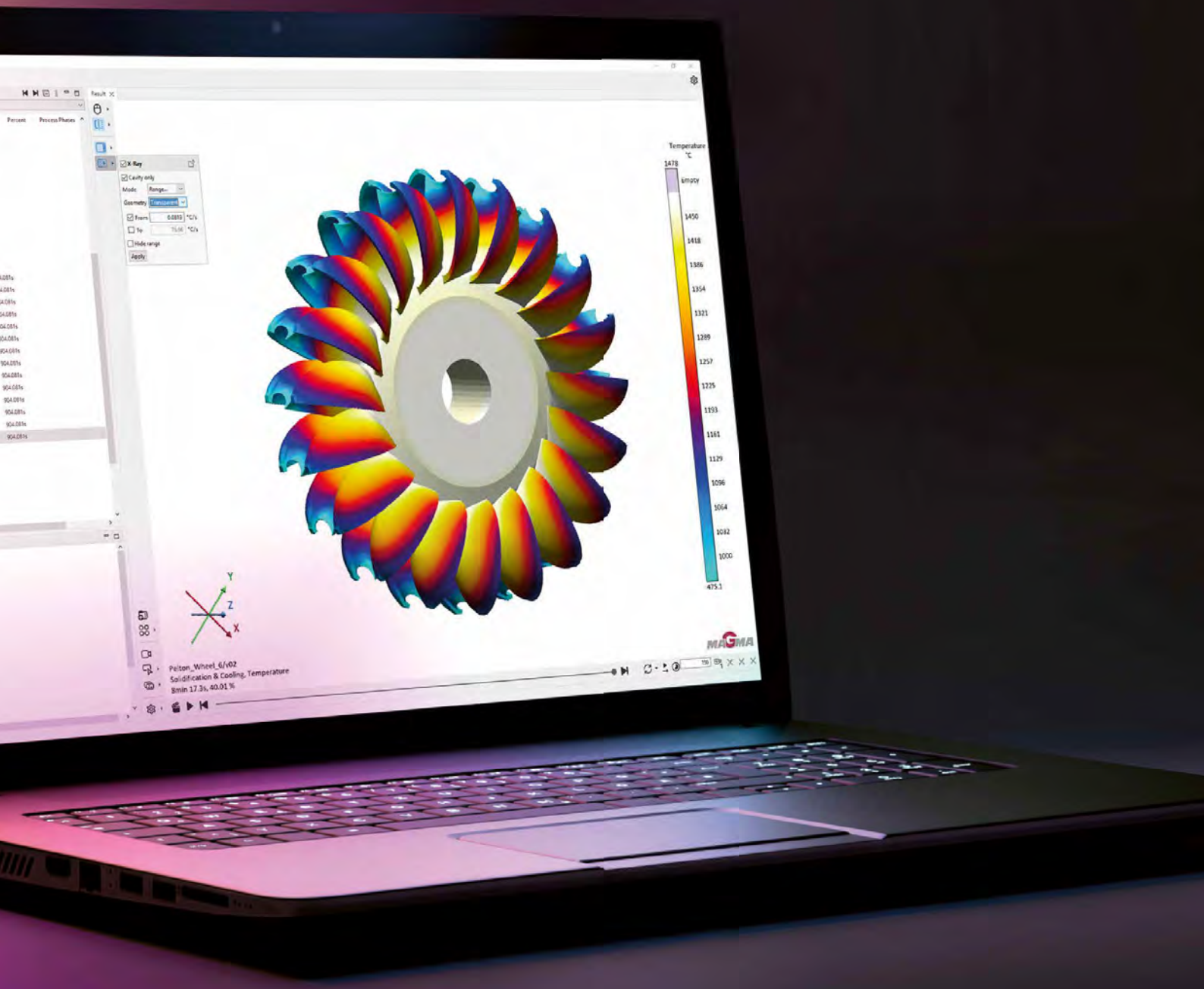

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TÜV-CERTIFIED

Safety check for personal protective equipment

TÜV Rheinland has certified Jutec's new "Heat Protection compact" process. The safety check helps safety officers in industries with heat-exposed working environments ensure that their colleagues receive the best possible heat protection.

The certificate was officially handed over at the A+A 2023 trade fair for safety and health at work in Düsseldorf by Olaf Seiche, Regional Business Field Manager and Registered Manager of TÜV Rheinland Cert GmbH (Picture: Jutec)

Jutec has developed "Heat Protection compact" on the basis of long-standing best practice experience. The concept takes safety officers step by step through a process to analyze, assess, examine and document the situation of workplaces exposed to heat in a well structured way. From the results of this process, the safety officers can derive specific recommendations as to the optimal Personal Protective Equipment (PPE) for the working environment examined and the individual wearing it.

The central element of this safety check is an action plan that includes all steps from analyzing the situation at the respective workplace up to certifications required by the PPE regulation. JUTEC experts support their customers through the five-stage selection process:

- analysis of the current situation at the workplace,
- risk and hazard assessment – mandatory for every project,
- recommendations for the selection of the most suitable, approved fabric and the entire protective clothing, considering safety and wearing comfort aspects,
- proof of safety, e.g. by means of a spill test with molten metal,
- certification – the Jutec label certifies that the heat protection solution employed complies with all applicable rules and regulations.

Olaf Seiche, Regional Business Field Manager and Registered Manager of TÜV Rheinland Cert GmbH, explains why he thinks that this process deserves certification: "The process provides a systematic approach to assessing the risk of a workplace and contains very useful checklists. Companies can now rest assured that they comply 100 percent with all requirements of the PPE regulation for workplaces exposed to heat and that their employees are protected as best as absolutely possible. This has convinced us. Therefore, we have decided to grant the TÜV certificate."

Stefan Jung, Managing Director of Jutec GmbH, is familiar with the challenges safety officers are presented within their companies: "They have to make sure that they comply with numerous, highly complex rules and regulations applicable to all sorts of areas. Therefore, we have combined all technical information, current regulations and checklists into a safety manual specifically for the area of heat protection at the workplace. It contains everything necessary to analyze risks and hazards and achieve the optimal solution for the specific workplace and each individual employee … in this way, we are making an important contribution to enhancing safety in work environments where things get hot."

Jutec

> Companies can now rest assured that they comply 100 percent with all requirements of the PPE regulation for workplaces exposed to heat.
>
> *Olaf Seiche, TÜV Rheinland Cert GmbH*

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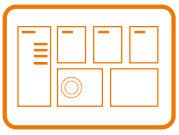

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STEEL CHANGING ITS COLOUR

HÜTTENTAG 2023 addresses the industry's most pressing challenges

Steel's annual technology event in Europe provides an assessment of the current situation in the climate transition of the steel industry

On 16 November 2023, 320 participants as well as 26 exhibitors and sponsors met in the city of Essen, Germany, to discuss what the steel industry is doing in the energy and climate transition. The HÜTTENTAG 2023 took place in the Glass Foyer East of Messe Essen under the patronage of the Lord Mayor of Essen, Thomas Kufen. It featured presentations and keynote speeches on commercial solutions for the steel industry.

The steel industry has accepted the challenge of the climate transition and launched investment programmes for decarbonisation worth billions of Euros. However, the high energy prices are a hurdle that can only be tackled with strong financial commitment of the governments, as "green" steel is indispensable for the society. Replacing blast furnaces with climate-friendly direct reduction plants and the resulting need for large quantities of renewable electric power and fossil-free hydrogen are just some of the specific topics currently being discussed. Commercial solutions for this were the focus of the HÜTTENTAG 2023 conference, for which DVS Media GmbH and Messe Essen GmbH, as joint organisers, can draw a more than positive balance.

The conference began with an opening lecture by Dr Martin Theuringer, Director of the German Steel Federation, entitled "On the road to green steel: What the steel industry needs now for a successful transformation". In their keynote speeches, Dr Peter Maagh, CEO of Dillinger and Saarstahl, and Felix Schmitz, CEO of Kloeckner Metals Germany, explained how green steel can secure a technological advantage and how green steel is highly valued by processors and end customers. Peter Maagh said that the problem of the high cost of energy could not be solved in the long term by the government regulating the price of energy. We need more energy – namely renewable energy, said Maagh. Only if more energy is produced can there be a chance that prices will start to fall again. Felix Schmitz explained that steel processors are looking for solutions to reduce GHG emissions by 30 per cent in the short term, for example. CO_2-reduced steel offers an excellent opportunity to differentiate themselves with a green steel product. This is an obvious argument, according to Felix Schmitz, and very important when talking to steel processors. In the panel discussion that followed, moderator Nadine Pungs went into further detail on some of the aspects mentioned.

In the afternoon, six sessions with a total of 22 specialist presentations were held in parallel, focussing on specific aspects of the energy and climate transition in the steel industry. The various presentations in the first train were then devoted to "Decarbonised process routes and supply chains", "Digitalisation in energy management and communication" and "Automated production technology 4.0". The other series of sessions focused on "The digitalised steel plant" (I + II) and "Steel in the circular economy".

With a summarising outlook, the participants, guests and exhibitors were then given a farewell to the thoroughly successful event in the evening. Many of the solutions presented during the day were later discussed further at the get-together HÜTTENABEND, which was opened with a welcome address by Thomas Kufen, Lord Mayor of the City of Essen. Attendees naturally also took advantage of the relaxed atmosphere of the well-attended gathering to network.

Dirk Sieben, Managing Director of DVS Media GmbH, gave a positive summary of this year's event: "Today's presentations and discussions have shown that the HÜTTENTAG was once again the place to be where participants can find solutions to the enormous challenges facing the steel industry. We are delighted that our conference format is helping to bringing the players together and fostering the exchange of ideas."

The next HÜTTENTAG will take place at the same venue on 19 November 2024.

DVS Media / Messe Essen

> HÜTTENTAG was once again the place to be where participants can find solutions to the enormous challenges facing the steel industry.
>
> *Dirk Sieben, Magaging Director at DVS Media*

Some Impressions of HÜTTENTAG 2023 – steel's annual technology event in the heart of Europe (Pictures: Christian Thieme)

ASIA - CHINA

Xiangtan upgrades plate mill automation

Primetals Technologies has successfully completed the extensive upgrade of Xiangtan's plate mill automation. The new Level 2 automation system installed improves end-product quality and stabilizes the production.

Xiangtan awarded Primetals Technologies the final acceptance certificate two weeks ahead of schedule. The implementation phase lasted only six weeks. The upgrade of the process optimization system ensures that the predictions of roll force and roll torque are improved. In addition, the complete rolling process is stabilized, in particular when rolling small lots and different steel grades.

A part of the Level 2 system, the Set Point Monitor makes the rolling process more flexible by synchronizing the Level 1 and 2 automation systems, for instance, after parameter adaptions, interventions by operators, or after any unplanned events. Another module of the Level 2 system, the Path Keeper, locks the desired thickness at a predetermined part of the rolling process and onwards until the plate leaves the mill. This protects the process automation system against noisy data, i.e. data that might result in false conclusions.

The upgrade of the Level 2 automation system at Xiangtan Iron and Steel's plate mill has resulted in improved plate quality. (Photo: Primetals Technologies)

Primetals Technologies

ASIA – CHINA

Ansteel Group to start production of EV electrical steel strips

Tenova LOI is set to supply the core component, an advanced annealing furnace, for a new annealing and coating line.

Tenova LOI Thermprocess and Ansteel Group signed a contract for a cutting-edge annealing and coating line (ACL). Tenova LOI is set to supply the core component, an advanced annealing furnace, for the ACL. The supply is integral to Ansteel Group's innovative steel project, which is geared towards the production of electrical steel for electric vehicles (EVs) and will make it the first production line of its kind in Northeast China. The standout feature is the annealing furnace equipment, which merges essential imported components and furnace automation control from Tenova LOI Thermprocess, Germany, along with local contributions from Tenova Technologies (Tianjin), China.

Tenova LOI Thermprocess' ACL for non-grain oriented (NGO) electrical steel strips is engineered to handle high annealing temperatures, elevated H_2 content in the process gas, and high strip processing speed. In addition, advanced cooling systems ensure low cooling rates and homogeneous cooling effects across the steel strip width, which are critical for high grade NGO electrical steel strip, particularly for electric vehicles.

Innovative process gas separation technology allows the furnace sections to operate with varied process gas combinations. Tenova LOI Thermprocess mathematical models are integrated in the furnace control PLC to fulfil the demanding requirements for strip annealing accuracy and stability.

Once this complex project is finalised, the new production line will be able to meet Ansteel's demand for premium electrical steel, crucial for EV manufacturing, positioning Ansteel as a global player in sustainable steel production and fostering a green path toward industrialization.

Tenova LOI Thermprocess

ASIA – CHINA

Baowu to order new silicon steel lines for the greenfield project in Wuhan

Tenova took part in the on-site signing ceremony with Baowu Group for the new Silicon Steel Optimization Project of Wuhan Iron & Steel Co., Ltd. (WISCO)

During the 6th China International Import Expo, Tenova LOI Thermprocess secured four contracts with the Baowu Group, underscoring a commitment to advancing the metals industry's green transition. The contracts involve the supply and installation of three Annealing and Coating Lines (ACL) and one Annealing and Pickling Line (APL) specifically designed for silicon steel. These advanced lines will be integrated into Wuhan Iron & Steel Co. works in Wuhan. These contracts are part of the company's Energy Non-Oriented Silicon Steel Product Structure Optimization Project, a greenfield project aimed at achieving superior surface qualities and optimal magnetic properties of non-grain oriented electrical steel.

The comprehensive contract covers from the design and supply of advanced process equipment to commissioning and production support. Tenova LOI Thermprocess will collaborate with Tenova Technologies (Tianjin) to ensure seamless execution.

Upon completion of this project, the new production lines will significantly enhance the company's capabilities in producing high-quality electrical steel. These materials are crucial for manufacturing energy-efficient electric motors for modern electric vehicles. Ultimately, this ambitious project positions the Baowu Group as a global player in the sustainable steel production landscape.

Tenova LOI Thermprocess

ASIA – INDIA

NMDC Nagarnar commissions blast furnace No. 1

NMDC and Danieli Corus have successfully commissioned the first blast furnace of the new Nagarnar integrated steel plant. The first hot metal was tapped within 48 hours of the blow-in.

The Nagarnar steel plant was developed by state-owned National Mineral Development Corporation – traditionally a mining company – with the objective of expanding its scope of activities downstream into the steel production value chain. Danieli Corus was contracted for the blast furnace complex.

The blast furnaces are designed with the Danieli Corus proprietary plate-cooled lining technology, long-life hot-blast stoves that allow for refractory expansion, and a tangential single-inlet gas cleaning cyclone. Blast furnace No. 1 has a working volume of 4,506 m³. It is designed for a daily production of 9,500 t of hot metal at a pulverized coal injection rate of 150 kg/t.

Danieli Corus

ASIA – INDONESIA

Gunung Raja Paksi and SMS group sign MoU on green steel development initiatives in Indonesia

SMS group and PT Gunung Raja Paksi Tbk co-hosted a two-day 'Focus Group Discussion (FGD)' event in Jakarta.

Under the banner of 'Green Steel in the Digital Age: A Focus Group Exploring Carbon Footprint Reduction,' the event brought together key stakeholders from the Indonesian steel industry. During the event, the two companies signed a memorandum of understanding, symbolizing their commitment to advancing sustainable steel industry procedures and processes through digital solutions.

The declared goal of the MoU is to drive green steel development initiatives in Indonesia. Argo Sangkaeng, President Director of GRP, on the collaboration with SMS: "We believe that this collaboration will bring positive changes to the Indonesian steel industry. We hope to explore innovative and sustainable solutions that will help reduce the environmental impact of steel production."

At the event, Tim Kleier, Head of Green Steel at SMS, shared insights into pioneering decarbonization strategies and the implications of the Carbon Border Adjustment Mechanism (CBAM) for the industry, emphasizing the pathway toward a greener and more sustainable steel sector. Lis Soares, Head of Energy Management at SMS, explored strategies for quantifying and mitigating carbon emissions in steel production while navigating the complex landscape of carbon taxes.

Over the course of the two-day event, this initiative served as a pivotal platform for exchanging knowledge and experience among stakeholders who share a deep commitment to environmental concerns.

SMS group

ASIA – INDONESIA

Premiere of GIFA and METEC INDONESIA

September 2023 saw the first edition of GIFA and METEC INDONESIA organized by Messe Düsseldorf. About 200 exhibitors from 18 countries and more than 4,900 trade visitors from all sectors of the foundry and metallurgical industries took part in the events at the JIEXPO Convention Center.

The about 200 exhibitors drew a large audience to the first edition of the trade fair duo GIFA and METEC INDONESIA. (Photo: Messe Düsseldorf)

The trade show duo impressed with a wide range of machines, equipment and technologies, from additive manufacturing and foundry machines to processing equipment and new technologies for user industries in various vertical markets, such as the automotive industry, the construction industry, the energy and gas sector, and metal and steel plants.

In addition, high-level seminars and an international lecture series on current industry trends provided space for discussion and facilitated an exchange of experience among experts. Malte Seifert, Director of "The Bright World of Metals" at Messe Düsseldorf, stressed Indonesia's potential for good business: "We are absolutely delighted to see how well our new GIFA and METEC satellite shows for the Asian market were received by the trade audience." The two trade shows were held in parallel with the 20th Mining Indonesia, Southeast Asia's largest international trade show for mining equipment, mineral extraction, and processing. Together, the events form an integrated business platform for the mining, metallurgy, and foundry supply chain, providing all participants with valuable synergy effects.

The next GIFA and METEC INDONESIA will be held from 11 to 14 September 2024 at the same venue.

Messe Düsseldorf

ASIA - INDONESIA

PT Krakatau Steel to modernize hot strip mill No. 1

After successful commissioning of the hot strip mill No. 2 PT Krakatau Steel (Persero) Tbk has placed an order with SMS group for a new electrics and automation system for their hot strip mill No.1 at the Cilegon works, Banten.

Hot strip mill No.1 with its with annual production capacity of 2.4 million tons, has been a significant facility of PT Krakatau Steel's operations. Originally constructed by SMS group in 1983, this hot rolling line comprises one roughing mill stand with edger, six finishing mill stands and two down-coilers.

For the current modernization project, SMS group will deliver an advanced X-Pact® electric and automation system, focusing primarily on level 1 and level 2 automation for the entire mill. This includes a new main and auxiliary drive system, as well as a low-voltage power distribution system for the finishing mill. The X-Pact® Vision HMI (Human-Machine Interface) with its advanced visualization concept and integrated faceplate technology will provide seamless operator guidance and enhanced maintenance flexibility. State-of-the-art level 2 mathematical models will further contribute to the improvement of the end product quality.

SMS group

ASIA – JAPAN

JFE to implement new EAF power supply

JFE Bars and Shapes Corporation decided to install a new Q-One power supply system on an existing EAF manufactured in Japan, at Himeji Works, Hyogo prefecture, in the west part of Japan, where bars and shapes are produced from scrap.

Designed, developed, and patented by Danieli Automation, Q-One makes frequency changes possible in arc furnaces. A frequency higher than network nominal improves arc stability and therefore is used during the boring stage, while a frequency below nominal – down to 20 Hz – is ideal for reducing energy consumption in the refining stage and for deeper penetration of the arc in the molten bath, as well as to induce a beneficial stirring effect on the molten steel.

The Q-One power feeder, which will be installed at Himeji Works by mid 2025, consists of seven units for an arc power of 72 MW; and is expected to improve energy and production efficiency by approx. 10%. Being a green investment, it will be subsidized by an energy conservation grant from the Japanese government.

Danieli

ASIA – THAILAND

Next Southeast Asian metal trade fair quartet scheduled for 2025

More than 400 exhibitors from 30 countries presented their technological highlights at wire and Tube Southeast Asia, which took place for the second time together with GIFA Southeast Asia and METEC Southeast Asia in Bangkok in September 2023.

wire Southeast Asia showcased machinery and equipment for wire production, wire processing and wire finishing, measuring, control and testing technology as well as new and further developed special wires and cables. At Tube Southeast Asia, the focus was on tube manufacturing, processing and finishing.

In 2025, from 17 to 19 September, wire and Tube Southeast Asia will once again be staged in Bangkok together with GIFA and METEC Southeast Asia.

Messe Düsseldorf

ASIA – TAIWAN

Feng Hsin Steel launches consulting cooperation to reduce CO_2 emissions

CO_2 reduction and climate change are by far the dominant issues of the 21st century and a global challenge for the steel industry.

As one of the most efficient mini-mills in Taiwan, Feng Hsin Steel Co. Ltd. is committed to reducing its CO_2 emissions by at least 25% by 2030 and achieving carbon neutrality by 2050. To meet this challenge and find the most appropriate action plan, the company has entered into a three-year consultancy agreement with Badische (BSE), starting this autumn. Sebastian Baumgartner, Managing Director of BSE, comments: "Feng Hsin Steel Co. Ltd is a well organised and highly productive steel producer. FH and BSE are looking forward to working together from steelmaker to steelmaker to achieve challenging goals for both sides".

Badische Stahl Engineering

Feng Hsin Steel operates a mini-mill with an annual capacity of 2 million t of rebar, structural steel and SBQ products (Picture: BSE)

AUSTRALIA

BF technology transition at Liberty Steel in Whyalla

Digimelter technology from Danieli adopted to reduce CO_2 emissions and increase production capacity

Sanjeev Gupta (middle), executive chairman of Liberty Steel, during the announcement ceremony at Whyalla (Picture: Danieli)

Liberty Steel announced the phase-out of coal-based steelmaking at Whyalla works, Australia, by purchasing a Danieli Digimelter plant to melt scrap/DRI at lowest carbon-emission levels, competitively. The selected 160-t Digimelter plant will be used for the clean production of 1.5 million t/year of liquid steel, raising the present production capacity from 1 million t/year. Initially fed by domestic steel scrap and other Fe-bearing materials, Digimelter will allow Liberty Steel Whyalla a 90% reduction in direct CO_2 emissions compared with traditional blast furnace production.

Digimelter comprises Q-One power feeder, Q-Melt suite of technological packages and "Zero Bucket" type continuous scrap-charge system.

The new Digimelter is expected to commence operations at the Whyalla works the middle of 2025. Liberty Steel has previously ordered two Danieli Digimelters, to be installed at the Ostrava steelworks in the Czech Republic – one of the first European integrated works moving for BF transition.

Danieli

AUSTRALIA

BlueScope receives ResponsibleSteel certification

BlueScope's Western Port site in Victoria has been assessed against the criteria within the ResponsibleSteel Standard.

ResponsibleSteel is a global multistakeholder standard and certification initiative for the steel industry. Its mission is to be a driving force in the socially and environmentally responsible production of net-zero steel, globally. Commenting on the site certification, BlueScope's Chief Executive, Australian Steel Products, Tania Archibald, said, "BlueScope is proud to achieve ResponsibleSteel site certification for Western Port. Through the audit process across all 12 sustainability principles, our approach to engaging with our communities, as well as our safety, supply chain, and human resource systems, were highlighted as areas of particularly high performance."

Western Port has a 1 million t/year of steel processing capacity with HRC sources from Port Kembla steelworks (Picture: Bluescope Steel)

Western Port is part of a fully integrated steel supply chain with hot rolled coil sources from BlueScope's Port Kembla Steelworks in Port Kembla, Australia. Port Kembla Steelworks was Australia's first ResponsibleSteel site, certified in February 2022.

ResponsibleSteel

THE AMERICAS – MEXICO

Ternium places orders for new steel plant investment in Pesquería

Ternium has placed orders with Tenova and Fives to supply equipment for its new state-of-the-art steel mill in Pesquería. The order for Tenova includes a direct reduction plant, an EAF and two ladle furnaces. Fives will design and supply a galvanizing line with a production capacity of up to 600,000 t.

The new steel plant will integrate Ternium's downstream operations in Pesquería (Photo: Ternium)

Ternium is investing in a new steel plant conceived to integrate the downstream operations in its Pesquería facility. The new facilities will use latest technologies and comply with the USMCA "melted and poured" rule of origin, while advancing the company's 2030 decarbonization commitment.

Tenova's scope of supply includes a direct reduction plant with integrated material handling system complete with stockyard and train unloading equipment, an electric arc furnace equipped with Consteel® and electromagnetic stirrer, two ladle furnaces and a fume treatment plant. The new steel plant will be designed for a production capacity of 2.6 million t of high-quality steel for the automotive sector.

The material handling system will be designed to feed the DR plant with the specified flow and quality of iron ore and will also provide handling and storage for DRI production. The DR plant, based on ENERGIRON® direct reduction technology jointly developed by Tenova and Danieli, will directly charge the EAF with the hot DRI. The furnace can also be fed with scrap in variable percentage in addition to hot DRI. It is equipped with the Consteerer® electro-magnetic stirring system developed through an exclusive global partnership with ABB.

The galvanizing line supplied by Fives will be designed for a production capacity of up to 600,000 t. The line will be able to process sheets up to 4.5 mm thick and 1,854 mm wide from cold- or hot-rolled base coils for construction and non-exposed automotive applications.

The galvanizing line will include proprietary Fives equipment for fully automated entry and exit coil handling, pre-cleaning and cleaning systems, a horizontal annealing furnace with high-efficiency, low NO_x burners and the hot-dip galvanizing and cooling equipment. The digital solution based on predictive modeling for furnace operation and comprehensive line automation, the advanced post-treatment section, the skin-pass mill, tension leveler and the automatic strip inspection system will provide for high quality of the galvanized products. It is planned to process the first coil by the end of 2025.

Tenova / Fives

THE AMERICAS – USA

HuSteel to build OCTG mill in Texas

HuSteel, welded tube and pipe manufacturer and part of South Korea's Shinan Group, is building a new greenfield plant in Splendora, Texas. The company has signed a contract with Fives for the design and supply of a complete OCTG solution.

Components of the OCTG line for the new greenfield plant in Splendora, Texas. (Photo: Fives)

Fives will provide engineering, manufacturing and supply of equipment to produce tube and pipe for the oil and gas industry in diameters ranging from 60 to 114 mm and wall thicknesses of up to 10 mm.

"The new plant in Texas will be our first facility in the United States. We are relying on Fives' presence in the local market, its long-standing reputation as a supplier of reliable equipment, and their vast experience. We look forward to starting production in this new facility in 2025," says Hoon Park, CEO of HuSteel.

Five will supply a complete solution from coil loading to tube finishing, including the slitter, welded tube and pipe mill, 6-roll straightener, finishing equipment and a packaging system.

"We are very proud and excited to be part of this new project delivering our complete solution from slitting to tube finishing. This is our largest fully integrated contract in our history," says Jon Dunn, President & Chief Executive Officer of Fives Bronx, Fives subsidiaries in the U.S. and U.K.

Fives

THE AMERICAS - USA

U. S. Steel inaugurates new electrical steel line

United States Steel Corporation has inaugurated its new, non-grain oriented (NGO) electrical steel line at its Big River Steel facility in Osceola, Arkansas.

The new line, with an annual capacity of a 200,000 t, expands Big River Steel's portfolio of products needed to serve growing markets and help customers meet their sustainability goals. U.S. Steel will use the line to produce steel grades for the expanding electric vehicle market.The line is the final step in a steelmaking process that utilizes up to 90 percent scrap steel as raw material and reduces carbon emissions (Scope 1 and Scope 2) up to 70-80 percent compared to traditional integrated steelmaking.

Following the full acquisition of Big River Steel in 2021, U. S. Steel commenced construction of the NGO line in October 2022. The project was completed on time and on budget.

U. S. Steel

THE AMERICAS – USA

Nucor exploring sites to build new rebar micro mill

Nucor Corporation is exploring potential sites in the Pacific Northwest to build a new rebar micro mill with an annual capacity of 650,000 t, subject to approval by Nucor's Board of Directors.

The new mill would produce a full range of rebar sizes and have spooling capabilities. This would be Nucor's fourth rebar micro mill, joining its existing scrap-based micro mills in Missouri and Florida and the mill currently under construction in North Carolina.

"We have had great success with our rebar micro mills in Florida and Missouri and are on schedule to begin operating our third micro mill in the first quarter of 2025, which we are currently building in North Carolina," said Leon Topalian, Chair, President & Chief Executive Officer of Nucor. "Locating a new rebar micro mill in the Pacific Northwest provides us with an excellent opportunity to better serve our customers in the region."

Nucor Corporation

THE AMERICAS – USA

Nucor and Helion collaborate on development of fusion power plant

Nucor Corporation collaborates with fusion power company Helion to develop a 500 MW fusion power plant. This transformational project will offer baseload zero-carbon electricity from fusion directly to a Nucor steelmaking facility.

Nucor is making a direct investment of US$ 35 million in Helion to accelerate fusion deployment in the United States. The companies are working together to set a firm timeline and are committed to beginning operations as soon as possible with a target of 2030. "Nucor continues to position itself as a leader in developing clean energy solutions to decarbonize the industrial sector," said Leon Topalian, Chair, President, and Chief Executive Officer of Nucor Corporation.

Helion has already achieved remarkable milestones, including the construction of six working fusion prototypes and being the world's first private fusion company to achieve 100-million-degree plasma temperatures. Currently, the company is building its seventh prototype, Polaris, which is expected to be the first to demonstrate electricity generated from fusion.

Nucor Corporation

THE AMERICAS – USA

River Metals Recycling acquires recycling facility

River Metals Recycling (RMR) has acquired Cincinnati-based Garden Street Iron & Metal, bringing RMR's total number of recycling facilities to 19.

RMR is a wholly owned subsidiary of The David J. Joseph Company, a Nucor subsidiary, providing scrap brokerage, recycling and transportation services. The acquisition is consistent with Nucor's raw materials strategy and demonstrates its commitment to expanding the regional recycling platforms supporting the company's steel mills. The assets acquired from Garden Street Iron & Metal include a feeder and a shredder yard. In 2021, another Nucor scrap recycling affiliate, Trademark Metals, purchased Garden Street's recycling facilities in Fort Myers, Florida.

Nucor Corporation

THE AMERICAS – USA

Rebranding and new logo of Commercial Metals Company

CMC (Commercial Metals Company) has unveiled a refreshed identity to better represent the goals, commitments and evolution of the company.

From a single scrap yard in Dallas, Texas, in 1915, CMC has grown into a Fortune 500 company with hundreds of facilities and nearly 13,000 employees serving customers around the globe. "For more than a century, CMC has been recognized as a metal recycling and steelmaking company," said Peter Matt, President and CEO of CMC. "Our original name, Commercial Metals Company, made sense as we acquired companies that fell under our umbrella as a metals company. But as we began executing on CMC's growth strategy to expand the scope of products and solutions we provide to our customers beyond metals, we identified both a need and an opportunity to portray the company in a different way."

CMC's updated logo forms part of the company's rebranding effort. (Photo: CMC)

As a result of this rebranding effort, Commercial Metals Company will now market the company and its products under the name CMC.

CMC

SUSTAINABLE POWER GENERATION

thyssenkrupp Steel commissions micro steam turbine to recover energy

A micro steam turbine installed on the roof of the heating plant at the Hamborn site of thyssenkrupp Steel uses the energy provided by steam to generate around 1,800 MWh of electricity per year. The project represents a further building block for the efficient use of process gases at thyssenkrupp Steel.

The freight container in which the micro steam turbine is housed was hoisted onto the roof of the central heating plant on the 13th of October (Picture: thyssenkrupp)

Earlier this year – in October, a micro steam turbine weighing 5 metric tons was lifted by a truck crane into its ultimate position on the roof of thyssenkrupp Steel's central heating system at the Duisburg-Hamborn works in Germany. This micro steam turbine is used to convert excess pressure of process steam into electrical power.

The innovative technology uses steam from various sources that are brought together on the roof of the central heating system of the Hamborn site. Here, a steam pressure regulator reduces the main steam pressure of approx. 13 bar to the required operating pressure of approx. 2.2 bar. The micro steam turbine uses the potential energy of the steam which would otherwise go unused in conventional steam pressure reduction. The steam drives a turbine wheel and thus generates electrical power via a generator.

The micro steam turbine was developed by the German turbogenerator company Turbonik in cooperation with the research engineers of Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT, and has garnered the Innovation Prize of the German Steel Federation in 2018, among other plaudits.

"The new micro steam turbine will generate around 1,800 MWh of electricity per year in future. This corresponds to the annual consumption of about 420 four-person households," says Stefan Saalberg of thyssenkrupp Steel. "It is yet another innovative idea with which we at thyssenkrupp Steel are optimising our processes. It will also reduce CO_2 emissions in as many places as possible in conventional steel production."

As an integrated iron and steel works, thyssenkrupp Steel employs various processes in its power plants to generate heat and electricity with the steel mill gases from the coking plant and blast furnace. The micro steam turbine generates electricity cost-effectively and in a way that reduces resource consumption; it thus represents another building block in the efficient use of energy during steel production.

thyssenkrupp Steel

> It is yet another innovative idea with which we at thyssenkrupp Steel are optimising our processes.
>
> *Stefan Saalberg, project manager at thyssenkrupp Steel*


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DECARBONIZATION

Intelligent cranes and automatic scrap yard for Algoma Steel's transition project

Danieli is manufacturing six scrap and meltshop automatic cranes for the new Digimelter meltshop

The intelligent cranes have been manufactured at the workshops of Danieli Thailand (Picture: Danieli)

Algoma Steel relied on Danieli technologies for the BOF transition project at its plant in Sault Ste. Marie Ontario, Canada, where a Danieli Digimelter-based new green steel shop with design capacity of 3.7 million short tons (3.36 million t) of advanced grades of liquid steel is under construction.

The order awarded by Algoma Steel to Danieli also includes meltshop cranes and a Q-SYM2 automated scrap yard, featuring automatic cranes, scrap visual-recognition, and automatic scrap sorting and charging – crucial equipment for the good functionality of the meltshop.

Three members of Algoma Steel's engineering team recently travelled to Danieli Thailand to conduct extensive factory acceptance testing on the cranes before shipping to Canada.

The two 517-t, 31.5-m-wide meltshop cranes have been inspected, one in remote mode and one in the shop. They are designed to be powerful enough to pick up the whole furnace (top and bottom shell) in one lift, providing for quicker turnaround time on monthly furnace rebuilds, in addition to serving the Digimelter moving the iron ladles and scrap buckets, supporting a dual furnace operation.

Four more fully-automated cranes are being built for the scrap yard, and one has been inspected. These cranes will be equipped with scanning technology that makes it possible to check for any undesirable type of material within the scrap before the transfer into the scrap bucket.

The Algoma engineering team of Mike Pearce and Paul Jodoin testing the various electrical systems (level 1 automation) and Tom MacMillan focusing on the mechanical components, were impressed by what they saw and said: "The factory was fantastic. The people we worked with were very accommodating and they produced some very well-built cranes. We left with a high degree of confidence that these cranes will do their jobs." noted Mike.

Danieli

Algoma's transition from blast furnace to EAF steelmaking

Based in Sault Ste. Marie, Ontario, Canada, Algoma is a fully integrated producer of hot and cold rolled steel products including sheet and plate. The company continues on its transformative journey toward sustainable steel production. Algoma's transition from blast furnace to electric arc furnace ("EAF") steelmaking marks a significant step towards reducing its carbon footprint and contributing to a greener and more sustainable future. This commitment to innovation and environmental stewardship demonstrates Algoma's dedication to playing a leading role in the industry's transition toward a low-carbon economy.

Algoma's EAF project is the largest industrial-scale carbon reduction project in Canada, supported by the Ontario government through its commitment to critical energy infrastructure, and by the Government of Canada. In the framework of the project Algoma installed the first structural steel columns in February 2023 at its future electric arc steelmaking facility ('EAF'). Algoma Steel partnered with Hamilton, ON-based Walters Group Inc. in fabricating and erecting the main EAF building and ancillary structures, which include leading technology to reduce sound and emissions. Walters is using Algoma's steel plate products in the fabrication of the heavy structural components, and working with local industrial contractor, SIS Manufacturing Inc., for the fabrication of these key elements.

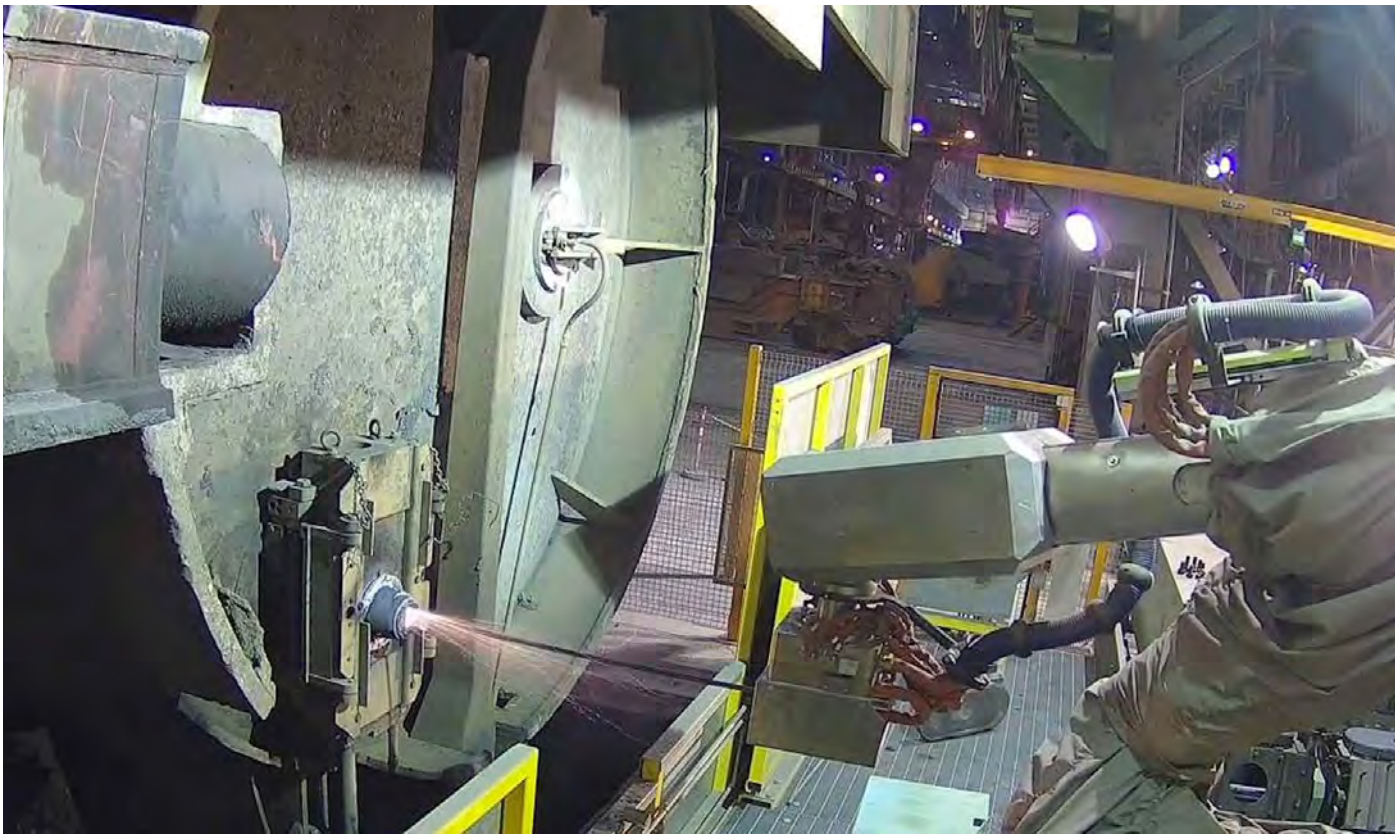
Onsite assembly of the building structure is targeted for completion within the year 2023. Commmissioning of the whole EAF project is on track for mid-2024. Once the project is completed, Algoma shall be one of the lowest-cost green-steel production facilities in North America, expanding annual steelmaking capacity from 2.8 million short tons to 3.7 million short tons with a significant reduction (estimated at approximately 70%) in carbon emissions.

Algoma Steel Group Inc

STEELMAKING

Robot performs ladle sliding gate maintenance operations

A new robotic cell can support the operator in the maintenance of the ladle sliding gate. The automatic solution does not completely replace human intervention but provides support. It will enhance the safety of the workers and improve the reliability of the production process.



RoboHarsh performs safe ladle sliding gate maintenance operations in steel plants (Picture: Polytec)

RoboHarsh – this is the name of the research project co-financed by the European Union through the Research Fund for Coal and Steel that, between 2016 and 2019, involved Polytec together with the Scuola Superiore Sant'Anna (SSSA) and PSC. The aim was to create a robotic cell to support the operator in the maintenance of the ladle sliding gate, a "critical" component for steel mills because, through this device, liquid steel flows after the refining and treatment processes. This operation requires a combination of strength, sensitivity, and extreme precision: cleaning and replacement of the heavy refractory components require considerable effort and must be carried out near the base of the ladle, which, although empty, is still very hot. In addition, erosive processes on the refractories and residues that must be removed generate a number of different conditions, which the maintenance technician must cope with. On the other hand, small misalignments or imperfect removal of solidified steel residues can lead to malfunctions and even leakage of liquid steel when the ladle is in operation, with serious consequences for the safety of the workers and the reliability of the production process. For this reason, maintenance operations are usually carried out manually by highly specialised workers.

Precise, reliable, adaptable and easy to use

Valentina Colla, coordinator of the project and of the SSSA team involved in the research, said: "The challenge was to create a system that was robust, precise, and reliable, but also adaptable to different steel plant layouts and situations and easy to use for operators. The implementation of a sophisticated artificial vision system

and a powerful but intuitive man-machine interface with an integrated automation system made it possible to meet this challenge, thus upgrading the task of the operator who becomes a supervisor, relieving him from the most onerous operations and limiting his exposure to high temperatures to a minimum, and instead allowing him to constantly monitor operations directly from the control desk, with an overall improvement in the management of each phase."

Andrea Faes, head of Polytec's Mechatronics Department, adds: "Our great knowledge of the environment and the steelmaking process enabled us to overcome the obstacles related to the critical meltshop environment, where fumes, dust, and several aggressive agents, including temperatures, make the implementation of human-robot cooperative systems more difficult. Each element was chosen considering the peculiarities of the process. From the engineering to the choice of components, the team worked with great dedication to achieve the final goal and create a prototype to be tested in the plant. The former Ilva-plant in Taranto was willing to receive the prototype and, after the final tests were passed, it was definitively purchased. Today we are proud to say that this research and technological project has become a concrete solution available on the market."

Andrea Faes and Ion Rusu with the European Patent obtained for this robotic solution (Picture: Polytec)

The robotic cell developed does not completely replace human intervention but supports and improves it. The robot manipulates all the heaviest components, carries out cleaning operations with an oxygen lance and, using a sophisticated artificial vision system, thoroughly examines the device to analyse the wear condition of the components. Each operation is authorised and verified by operators from the pulpit who supervise the operations through a graphical interface that proposes, analyses, and processes the images collected by the vision system, providing useful information and suggestions to the operator, the final decision-maker.

Every technological innovation, in order to be successful, must be accompanied by a process of cultural change. It is the end users who provide the information that is essential for the continuous improvement of the actual machine functionality. This concept is also fundamental to the RoboHarsh project: the operators were involved from the earliest design stages, and a team of sociologists from the Technical University of Dortmund, Germany worked alongside to design an appropriate training course for the workers while also collecting an overall evaluation of the system's performance. Once again, Polytec's multidisciplinary and open approach proved to be the winning choice to realise concrete technological solutions and successfully meet the challenge of digital transformation in the most complex industrial processes.

> Obstacles related of the meltshop environment make the implementation of a human-robot cooperative system difficult.
>
> *Andrea Faes, Head of the Mechatronics Department at Polytec*

Polytec – a BM Group company

STEELMAKING

More quality large-size blooms and billets produced at MaSteel

Recently Maanshan Iron & Steel started simultaneously its two new Danieli casters for quality jumbo blooms and billets in Yushan District, Maanshan, Anhui province, China

Two brownfield projects were carried out in just 14 months, reaching stable production levels, thanks to the close cooperation between the project team of MaSteel and the technical team of plant supplier Danieli. A full Level 1 automation system for both casters – which has been included in the existing Level 2 plant automation – comprises the Danieli liquid pool control system for accurate and balanced secondary cooling.

The four-strand jumbo caster can produce blooms of diameter 600 to 1200 mm (Picture: Danieli)

The billet caster produces quality 220-mm-square and up to 250-mm-round products on eight strands (Picture: Danieli)

Jumbo bloom caster. Featuring a 18.5-m radius, the four-strand jumbo bloom caster is certainly the world's largest plant of its kind. It will produce quality rounds ranging from 600 to 1200 mm diameter, mainly for the power, energy and rail industries (rail wheels). To maximize the yearly productivity and reduce restranding times, the jumbo caster is equipped with a top-feeding dummy bar. The design is completed by an extended battery of withdrawal and straightening units which, in addition to the four pinch rolls, contribute to support and straighten the jumbo-size products. The caster will make combined use of mould, strand and final stirrers.

Billet caster. The 12-m-radius billet caster produces quality 220-mm-square and up to 250-mm-round billets on eight strands. Equipped with Danieli Fast Cast Cube, mould and final stirrer performs soft / hard reduction on billets, with the combination of twin and single modules for a large variety of quality steel grades, in submerged mode. The product mix includes bearing and high-carbon structural grades.

Conclusion. These two new plants are the 5th and 6th long-product caster projects carried out by Danieli for MaSteel since 2000. Presently, MaSteel can produce up to 6.8 million t/year of continuously cast long products.

Danieli

DIGITALIZATION

Measurement technology to boost safety in bar and wire rolling lines

Primetals Technologies has developed and implemented a portable safety technology known as the Digital Optical Caliper. This system eliminates the dangerous practice of manually determining the product section using wood or traditional calipers. The Digital Optical Caliper can precisely measure a variety of long rolling product sections, thereby identifying potential issues during production and promoting safer work practices.

The Digital Optical Caliper is a highly specialized, portable 'plug-and-play' gauge designed primarily for use in the roughing and intermediate areas of the mill and can be moved between different locations along the mill. The system is capable of measuring rounds, ovals, flats, and square sections with precision, eliminating the need for mill personnel to approach the rolling line during production. This innovative approach replaces the traditional methods of woodburning or physical calipering, which required operators to be near the rolling line during production to measure product sizes. This eliminates the necessity of operators spending time in hazardous environments to take product measurements, effectively reducing the risk of accidents.

Greater accuracy and productivity

The Digital Optical Caliper features two cameras, a tablet computer, and a portable supporting frame. The cameras mounted on the portable frame are used for measuring the height and width of the product providing real-time, accurate, and repeatable readings. The integrated computer processes the images from the camera using proprietary software that detects and defines the product dimensions. The dimensions of measurement are guaranteed to be within ± 0.1 millimeters, although even greater accuracy was attained during production trials.

Designed for portability, the Digital Optical Caliper simply clicks into pre-installed mounting base plates and can be easily moved between multiple locations along the mill. This not only allows the operators to maintain a secure distance from the steel product during rolling, but also reduces the time required to prove setup and attain consistent rolling parameters.

The unit is designed to achieve an IP65 protection rating, which is the second highest on the ingress protection scale, and can therefore operate efficiently in any mill environment. The measurement data collected during production enhances the troubleshooting process and aids in identifying issues such as roll wear and furnace soaking problems, including cold spots. Moreover, accurate section control improves quality and maximizes yield.

Primetals Technologies

Digital Optical Caliper is a safe and portable measurement system (Picture: Primetals Technologies)

ROLLING TECHNOLOGIES

Ultra-thin rolled electrical steel to drive green

Cold rolled strips for electrical steel are in high demand on the market. A proprietary technology designed by Fives enables a strip to be rolled down to 0.1 mm on the full width.

The thinner the strip, the more efficient the electrical equipment, though the production of this material presents a real challenge for steelmakers as the process becomes more complex. It involves several stages, one of which is cold rolling.

Cold rolling is a critical step as it is extremely challenging to roll the strip down to minimum values without breaking it. A 20Hi cold rolling mill was proven to be the best available technology to allow steelmakers to achieve such targeted properties, especially in terms of thickness and flatness.

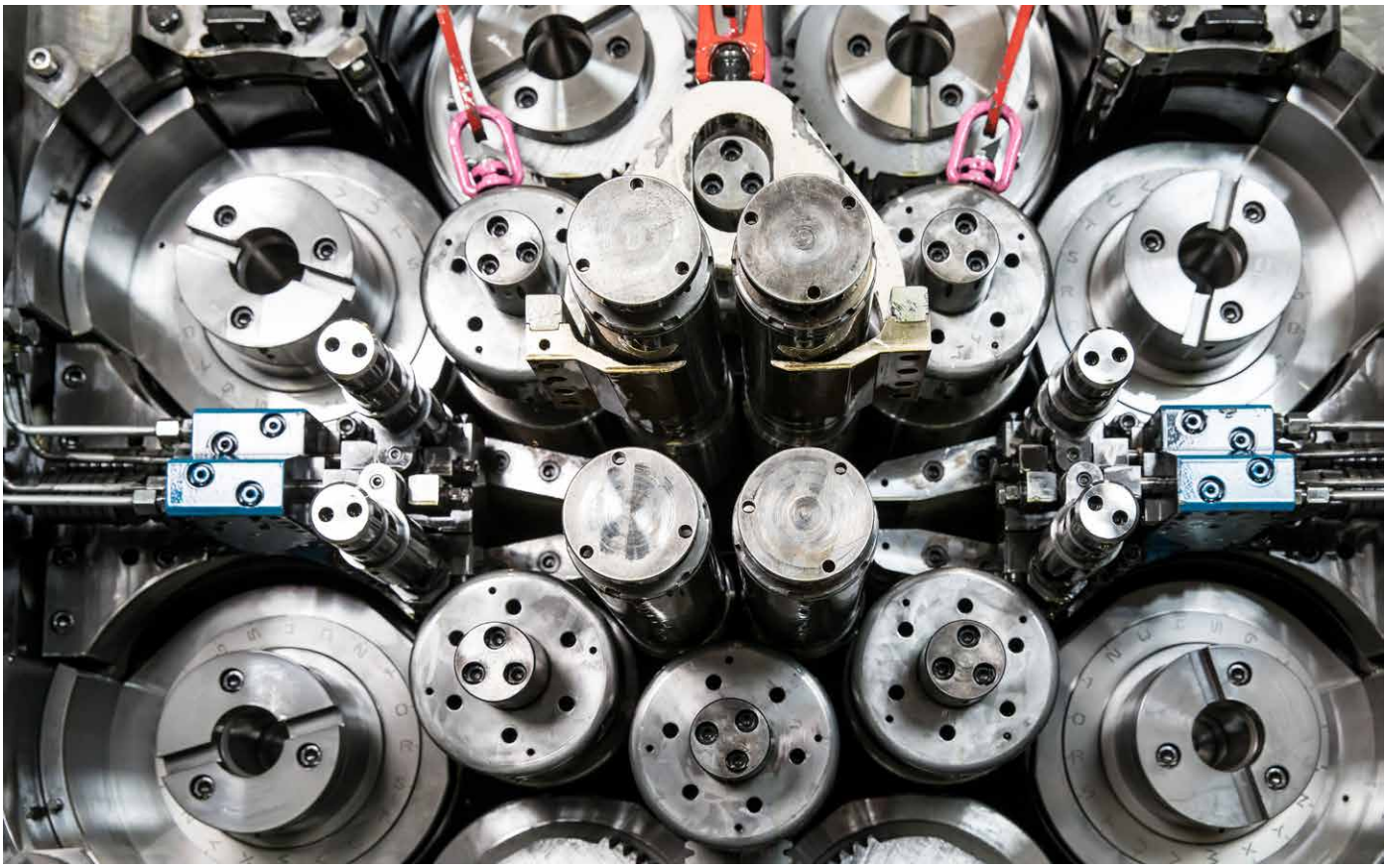
Fives, an international engineering group, designed its proprietary technology – DMS 20Hi EcoMill – which enables a strip to be rolled down to 0.1 mm on the full width of 1,250 mm. It represents a unique achievement in the cold rolling of electrical steel. The new rolling mill achieving 0.1 mm rolling thickness was recently supplied to Xinyu, part of China's Baowu Group. The mill is capable of producing 100,000 metric tons per year of high-quality NGO grades, which are mainly dedicated to high-performance electrical motors.

Technological superiority

The latest developments on the DMS 20Hi EcoMill include increased rolling speed and strip tension, advanced roll gap and strip lubrication for higher product quality (flatness and magnetic properties), special attention to fume extraction, better strip wiping efficiency and an innovative concept for flatness actuators. These technological features aim to reduce operating costs and increase the overall capacity of the mill, which is essential to stay ahead in the highly competitive steel market.

The critical parts of the DMS 20Hi EcoMill are manufactured in industrial workshops in Europe, which guarantees high quality material and safety standards for steelmakers worldwide. Combined with Fives' process expertise and customer support, this set of improvements enables the DMS 20Hi EcoMill to establish a new standard of performance that has never been reached before.

Fives



A DMS 20Hi EcoMill achieving 0.1 mm rolling thickness was recently supplied to Xinyu, part of China's Baowu Group (Picture: Fives)

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NEW STANDARD IN ROLL SHOP MANAGEMENT

The digital roll shop

The new roll shop management system "GEORG smartrsms" automates and optimizes roll shop logistics. It achieves higher throughput rates and reduces both process and HR costs. Moreover, it enhances process transparency and makes it possible to precisely control and monitor the processes in roll shops. The new system developed by German machine tool manufacturer GEORG is a future-proof system that uses state-of-the-art communication technology and provides high scalability.

The function of roll shops is to recondition work and back-up rolls as efficiently as possible to make the rolls ready for reuse in the rolling mill in the shortest possible time. While modern roll grinding machines already operate at very high efficiency, the automation of the logistics processes and establishing data links to higher-level, IT-controlled management systems still provide great potential for process acceleration and costs reduction.

This is why the productivity of a roll shop depends not only on the actual grinding times but to a large degree also on the duration of auxiliary activities such as transporting the rolls, setting up the machines, removing and setting the rolls back in, cooling and cleaning processes as well as maintenance.

"ultragrind10" grinding machines are charged by a semi-gantry loader (yellow)
(Picture: GEORG)

smartrsms – the brain of the automated roll shop

This was the reason for GEORG to develop its new "GEORG smartrsms" roll shop management system. It automates and optimizes all transport, loading, grinding and storage activities. The entire cycle from the delivery of the rolls to the machines, via the grinding process and through to the transport back to the rolling mill is to a large extend automated, reducing both the overall cycle time of the rolls and the number of personnel needed.

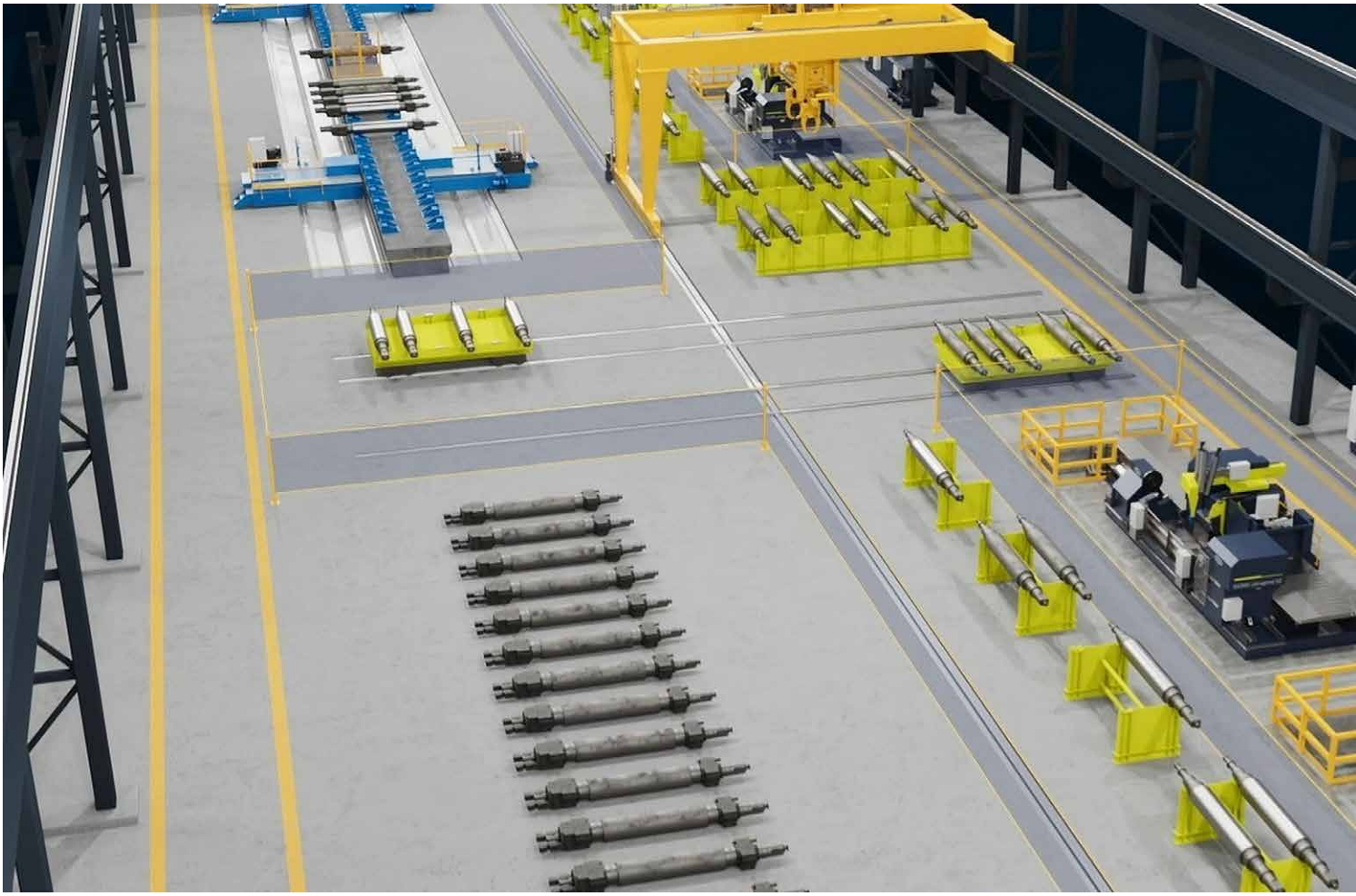
The roll shop management system consists of two software packages: The "Roll Scheduler" for planning the grinding jobs, and the "Roll Dispatcher", which – in smart coordination with the scheduler – actuates and controls the logistic and processing activities.

The purpose of the system is not only to automize but to also optimize the roll shop and handling logistics. This requires the availability of great volumes of data from different sources. The backbone of the roll shop management system is the server-based data network of the roll shop management system. The underlying software and the machine control system, both developed in-house, form a perfectly harmonized entity that ensures smooth interaction of all hardware and software components.

The roll shop management system "GEORG smartrsms" makes intensive use of sensors installed in the grinding machines as well as in the other roll shop and handling equipment. Thus, all logistical and roll machining activities are smartly interlinked with one another. All hardware components – rolls, chocks, handling equipment and machinery – are connected via a network and mapped in the software, along with information about their respective status. The data stored for each roll includes, for example, the entire roll history, i.e. geometry data and all reconditioning processes it has gone through in the past.

Thus, all process data from the rolling mill, of each individual roll and the respective machines are combined within one common system. From these data, the system generates reports and evaluations that make it possible for the operator to always get a current picture of all the processes and components involved, in particular, the condition of the rolls, chocks and machines, and the inventory situation. Roll shop status, roll inventory and machine maintenance reports, for example, can be edited per shift, day and other

Maximilian Bernau, Jan Ebener, Heinrich Georg GmbH Maschinenfabrik, Kreuztal, Germany – Contact: Jan.Ebener@GEORG.com



Roll shops with a high degree of automation usually consist of two areas: the manual (left) and the automated zone (right)
(Picture: GEORG)

periods, as desired. Thus, the system supports production managers in taking the right decisions in matters affecting the current production process, production planning or parts procurement.

Roll Scheduler – for optimal production planning

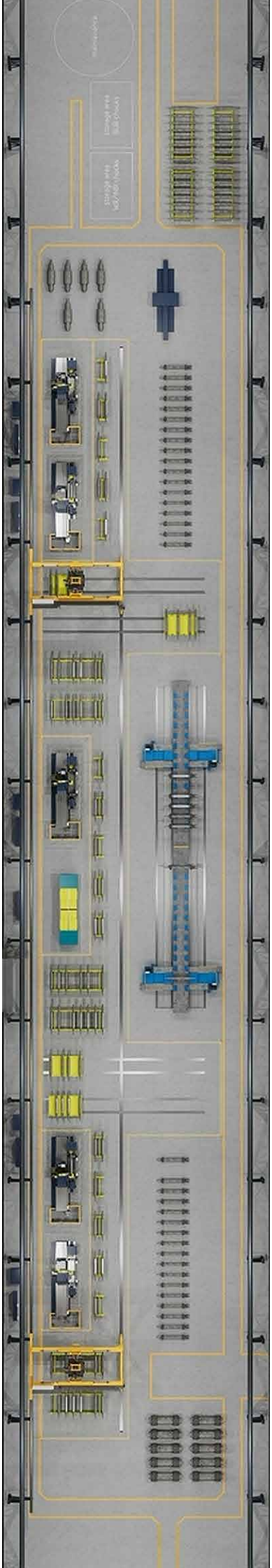
Based on the data captured by the roll shop management system, the Roll Scheduler plans and optimizes the roll shop processes according to the requirements of the rolling mill, automatically generating the job order for the transport, handling and reconditioning/machining of the respective rolls. It takes into account numerous factors, such as production planning in the rolling mill, the current status of the rolls delivered and the availability of the roll shop with its grinding machines, auxiliary, logistic and handling equipment. It decides where – i.e. on which machine – and when which roll should be processed and how and where it should be transported and stored. Additionally, it automatically defines the grinding and texturing programs according to the roll geometry and the grinding parameters specified. The schedule can be flexibly adjusted to changing conditions and requirements by means of the manual scheduling function. Thus, it is possible at any time to fit any special orders or campaigns into the schedule.

Roll Dispatcher – for the highest efficiency in roll shop and handling logistics

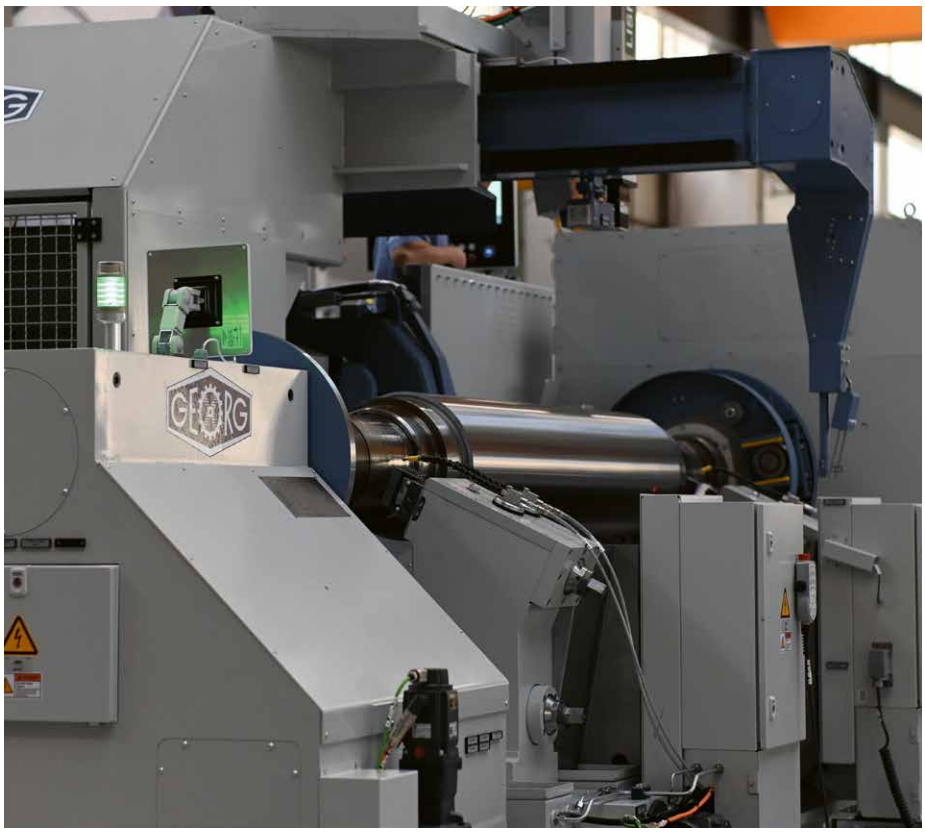
Roll shops with a high degree of automation usually consist of two areas: the manual and the automated zone. In the former, manual work such as the removal and reinstallation of the chocks is performed. In the latter, the rolls are handled and reconditioned in an automated process flow. The Roll Dispatcher generates the commands for all handling activities within this fully automated zone. According to the progress of the various activities taking place, the Roll Dispatcher assigns the "loaders" handling orders for transporting the rolls from and to the machines and storage places.

The head- and tailstocks are automatically positioned according to the geometry of the roll supplied. During grinding, all roll-specific process data are automatically stored in the background. The entire grinding process is performed automatically. The machines are controlled from the central control room.

After the grinding process, the roll geometry – diameter, shape deviations, etc. – is also automatically measured. Additionally, the rolls are inspected for surface and internal cracks. After these tests, the rolls are transported back into the manual zone or to an electric discharge texturing (EDT) machine for additional surface finishing.



In the automated process flow rolls that arrive from the rolling mill move from the manual zone to the automated one and back (Picture: GEORG)



The head- and tailstocks are automatically positioned according to the geometry of the roll supplied (Picture: GEORG)

After the grinding process, the rolls are inspected for geometry, surface and internal cracks (Picture: GEORG)

Communication – integration within all levels

Manual data entry is the most basic form of feeding the system with roll-specific data. Fitting the rolls and chocks with RFID chips speeds up the data entry process, avoids errors and facilitates the subsequent mating of the rolls with their respective chocks.

For all components, the platform-independent OPC UA standard is universally used to communicate between the roll shop (Level 1) and the management system (Level 2). As only data relevant for the specific use case are exchanged, no time-consuming interface programming or implementing and testing of interfaces and protocols is necessary. By using OPC UA, which is likely to become a worldwide standard, plant operators are assisted to save costs and, what is probably even more important, provides them a system fit for the future.

Communication with the rolling mill software systems (Level 2/3) is also via OPC UA. The roll shop management system receives information from the rolling mill and sends data to the higher-level systems. In this way, the system is seamlessly integrated into the Industry 4.0 environment of the mill.

Scalability – for high investment security

The system is scalable in two respects. On the one hand, it can be scaled up at any time to accommodate a greater number of machines. If the plant operator, for example, decides to invest in additional grinding machines, only minimum adjustments have to be made to the software. Thus, it is possible to start out with a small number of machinery and add further grinding machines or integrate other types of equipment, such as EDT machines, at a later stage.

On the other hand, the "GEORG smartrsms" can be easily scaled up from a roll data capturing and storage system to a comprehensive automation solution for complex roll shop logistics.

GEORG is currently implementing the first roll shop optimization and automation solution based on the roll shop management system in a US steel mill as part of a comprehensive digitalization project that covers all steel mill processes. Commissioning is planned for 2024.

GEORG

FORECAST UPDATE

Outlook on global steel demand 2023/2024

In October the World Steel Association (worldsteel) released an update of the short range outlook for 2023 and 2024. worldsteel forecasts that steel demand will grow by 1.8% in 2023 and reach 1,814.5 million t after contracting by 3.3% in 2022. In 2024, steel demand will see a further increase of 1.9% to 1,849.1 million t.

Commenting on the outlook, Máximo Vedoya, Chairman of the worldsteel Economics Committee, said, "steel demand has been feeling the impact of the high inflation and interest rate environment. Since the second half of 2022, the activities of steel using sectors have been cooling sharply both for most sectors and regions as both investment and consumption weakened. The situation continued into 2023, particularly affecting the EU and the US. Considering the delayed effect of the tightening monetary policy, we expect steel demand recovery in 2024 to be slow in the advanced economies. Emerging economies are expected to grow faster than developed economies, but the performance of emerging economies continues to diverge, with emerging Asia maintaining resilience.

We expect the situation in China's property market will stabilise in the latter part of the year and China's steel demand will record slight positive growth thanks to government measures. The 2024 outlook for China remains uncertain depending on the policy directions to tackle the current economic difficulties. We note that the Chinese economy is in a structural transition phase that may add volatility and uncertainty. Other uncertainty is linked to regional conflicts and unrest such as in Russia and Ukraine, Israel and Palestine, and elsewhere. This could contribute to rising oil prices and further geo-economic fragmentation, both of which are downside risks.

It is worth noting that despite the weakening of construction activities due to high-interest rates, infrastructure investment is showing positive momentum in many regions, even in the advanced economies, reflecting the effect of decarbonisation efforts."

General. The global economic outlook continued to worsen under the influence of monetary tightening that hurt consumption and investment alike. However, inflation started to moderate in 2023 thanks to the slowing economy, which may allow the ending of the monetary tightening cycles in 2024. However, the war against inflation is not over and continues to be threatened by multiple factors: persistent core inflation and a tight job market and rising oil prices.

The construction sector has been negatively affected by the high interest rates and high-cost environment, especially the residential sector. However, infrastructure investment remained positive and is cushioning the impact to some extent. Despite the easing of supply chain bottlenecks, the manufacturing sector continues to slow under weakening demand. The consumer durables sector has been particularly affected.

However, the recovery in auto production will continue in 2023, helped by the order backlogs and easing of supply chain bottlenecks, allowing high growth in many regions. However, the sector is expected to decelerate in 2024.

European Union and United Kingdom. While the EU (27) economy turned out to be more resilient than expected to the energy crisis brought about by the Russia-Ukraine war, high interest rates and energy costs are putting a heavy toll on manufacturing activities. The recovery of the auto sector continues, though. Despite the continued recovery, auto production is not expected to reach the pre-pandemic level in 2024. Residential construction is also affected by high interest rates, materials costs, and labour shortages, while the momentum in infrastructure investment remains stable. Germany is in a particularly difficult situation, with both a manufacturing recession and a housing crisis. With monetary policy expected to remain tight, a rebound in real demand is not foreseen for 2024, but as destocking cycles end,

> Infrastructure investment is showing positive momentum in many regions, even in the advanced economies, reflecting the effect of decarbonisation efforts.
>
> *Máximo Vedoya, Chairman of the worldsteel Economics Committee*

a technical rebound will enable positive growth in steel demand in 2024. After a fall of 7.8% in 2022, steel demand is expected to fall by 5.1% in 2023. Growth of 5.8% is expected in 2024.

Other Europe. Turkish steel demand is expected to record very high growth of 19.0% in 2023 and to continue to grow in 2024. Steel demand will benefit from the earthquake-related construction activities and the abandonment of its unconventional monetary policy that drove foreign investment out of the country. After falling by 2.5% in 2022, steel demand in other Europe is expected to increase by 14.9% in 2023 and by 5.1% in 2024.

Russia/CIS + Ukraine. After performing better than expected in 2022, with only a minor contraction in GDP thanks to massive government stimulus measures, the Russian economy is expected to record a small positive growth in 2023, helped by oil revenues and adjustments of the economy to the sanctions. Steel demand is also expected to recover moderately in 2023. But in 2024, Russia will see a deteriorating economic environment with currency depreciation, labour shortages, and supply chain disruptions. Industrial production will deteriorate due to reduced access to modern technologies and continuous restrictions on the import of spare parts. Despite the continuation of the war, the steel use situation in Ukraine is for stabilisation and improvement. Since March 2023, steel using sectors have shown an upward trend amid a low base of comparison. Construction activities are helped by relocation of businesses, construction of housing for internally displaced persons, restoration of damaged infrastructure, and development of new logistics routes. Forecasts for 2023-2024 have been revised upwards for both Russia and Ukraine compared to the April 2023 outlook, but significant revisions are possible depending on the course of the war.

worldsteel

DIGITAL FLEET MANAGEMENT

Telematic software tool for forklift trucks and similar vehicles

Combi Connect is a telematic software product that provides users of Combilift forklifts and other vehicles with greater levels of insight into fleet management and usage, providing real-time data on fleet performance, including location tracking, usage analytics, and maintenance alerts.

Combi Connect provides access to cutting-edge technology and expertise to make informed decisions, save costs, and optimize resources (Picture: Combilift)

Combilift, a leading provider of innovative material handling solutions, has introduced its latest product, 'Combi Connect'. This state-of-the-art telematics software empowers customers with comprehensive insights into fleet management and utilisation. Combi Connect offers real-time data on fleet performance, including location tracking, usage analytics, and maintenance alerts, enabling businesses to optimise their operations effectively.

Combi Connect operates on a subscription model, providing transparent data analytics that allow both dealers and customers to make informed decisions and efficiently manage their fleets. The platform offers a range of features to enhance fleet management, including impact monitoring, preventative maintenance capabilities, and smart analytics for actionable reports. Key features of Combi Connect are as following:

- Customer fleet management: provides invaluable insights into fleet operations.
- Transparent platform: offers a clear view of data to end customers, promoting informed decision-making.
- Impact/shock monitoring: enhances safety and allows for damage control accountability with: speed, drive mode, operator presence, time and location logs.
- Preventative maintenance: enables proactive maintenance to maximise machine uptime.
- Smart analytics: provides actionable reports for data-driven decisions.
- Full model range compatibility: easy to install, across all Combilift models including; electric, LPG and Diesel.
- Dedicated support team: ensures a seamless user experience and assistance.

Combi Connect further allows for monitoring truck location history, fleet mapping across multiple locations, energy/fuel consumption status, hour meter information, service planning based on machine usage, engine machine insights, current fault display, and advanced analytics for comprehensive data analysis.

By introducing Combi Connect, Combilift reaffirms its commitment to delivering advanced solutions that empower businesses to streamline their operations, enhance safety, and optimise resource utilisation.

Combilift

SYSTEMATIC OPERATIONS

Fast supply with high flexibility

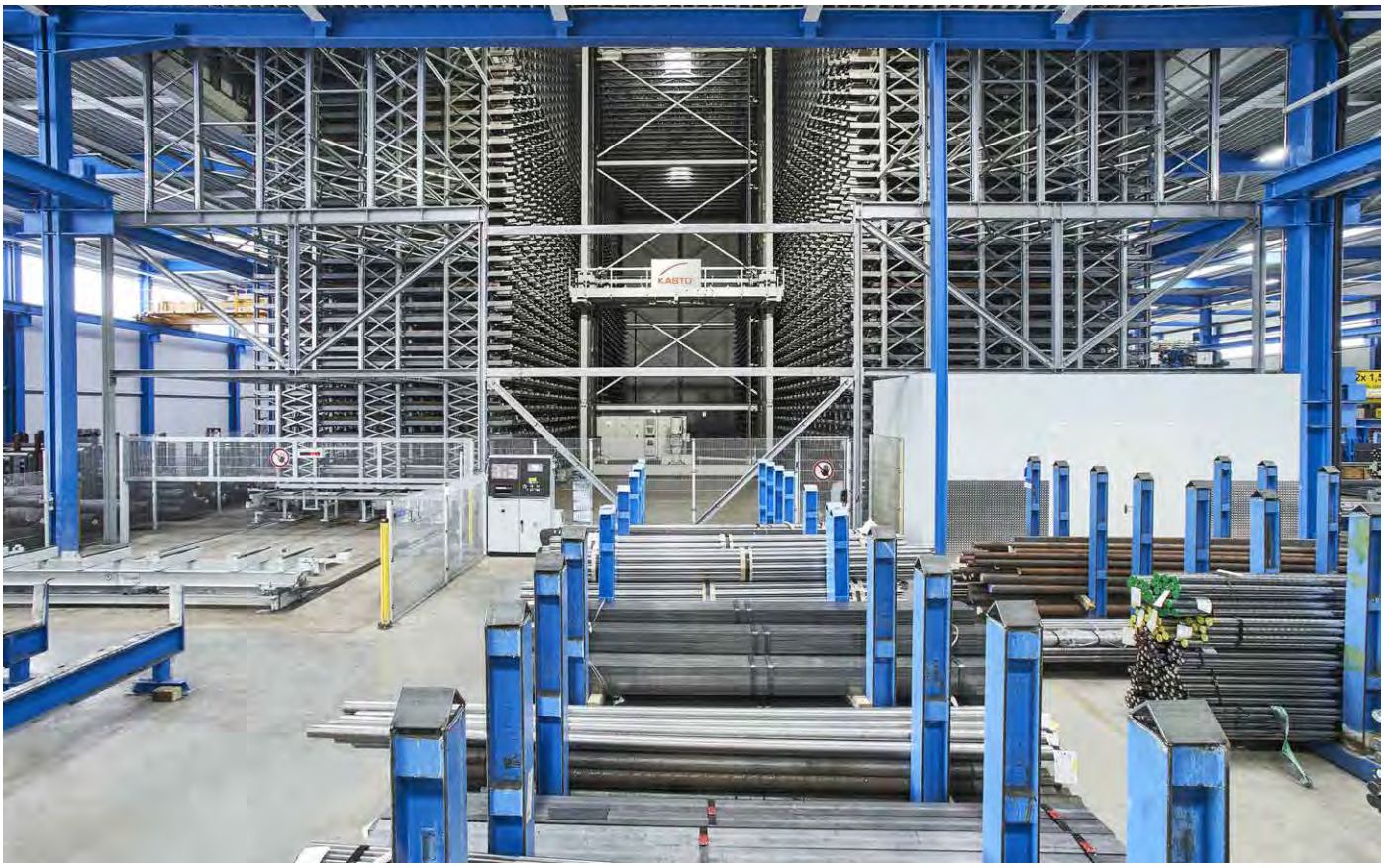
Numerous items, small batch sizes – this requires flexible and speedy handling. To offer customers such advantages, the steel distributor Hagelauer Dewald relies on an automated high-bay storage system from KASTO. Equipped with an automatic sawing centre, the company can handle processing stages for their customers, opening up the potential for growth in response to the current trend.

Stepping into the offices of Hagelauer Dewald GmbH in the town Pleidelsheim in southern Germany, you would never imagine what the buildings next to and behind it hold. Ever since the merger of Hagelauer and Dewald under the umbrella of the Lotter Group, their warehouses and production halls have been bulging at the seams. Hence, the management board decided to construct a new building to make use of every available metre, both horizontally and vertically, within the limited space. Now, located between the administration facilities and the new production halls, a 20-metre-tall building is accommodating the high-bay warehouse and the sawing centre. "Demolition and the erection of the new building took place basically amid ongoing operations. Nevertheless, we could maintain production throughout the entire construction phase," explains Jörg Bayer proudly. As one of two managing directors at Hagelauer Dewald, he shaped this "Growth" project and provided assistance all the time.

The new halls have an impressive appearance due to their expansion in all directions, roof greening, and the photovoltaic system installed on the roofs. Also, the basement has been sustainably designed. Beneath the foundation slab, posts were driven into the ground. Not only do these posts carry heavy loads, but they also harness geothermal energy from the ground. "We use the geothermal energy for heating and cooling of the office building," Jörg Bayer explains while adding: "We are committed to sustainability."

High-bay storage system as the core component

The perfect equipment in the halls is a vital component for the future growth of the



With its 14-t capacity, the honeycomb storage system is the core component in the new building at steel distributor Hagelauer Dewald (Picture: Kasto)

The storage system can feed the adjacent sawing centre with material via special saw cassettes and automatically longitudinal moving carriages (Picture: Kasto)

Jörg Bayer, Managing Director at Hagelauer Dewald (Picture: Kasto)

steel distributor. Hagelauer Dewald contacted Kasto Maschinenbau, a specialist in storage and sawing technology. Kasto had already been involved in the preliminary planning stages in 2019. They provided the structural calculations for the roof, the walls and the floor loads for the foundation onsite. "The experts at KASTO know exactly what and how to construct with the required stability for the massive weights," Jörg Bayer explains. In the 1990s, Kasto demonstrated their expertise by providing the first machines for Hagelauer. Later, a storage system and several circular saws were added to the machine park, which still perform well today.

A honeycomb storage system (UNICOMPACT 3.5) is the core component of the new building. It has a total storage capacity of nearly 14,000 tonnes. After its completion, it can accommodate 4,000 cassettes, each with a storage capacity of 3.5 tonnes. "We use this high-bay storage system to stock material and feed the surrounding processing stations," explains Jörg Bayer. There, employees pick the orders and handle the cut-to-length operations.

The fully automatic, unattended operation of the storage system is one of its unique features. The adjacent and also fully automated sawing centre (KASTOcenter varioplus 2) can be supplied with material via special cassettes and longitudinal moving carriages. "Not only was Kasto our first choice for storage systems, but from the very beginning, it was also our front-runner when selecting new saws", the managing director emphasizes. This enabled Kasto to automate the process from raw material storage to initial processing to the structured supply of the processed material in loading carriers in one comprehensive solution.

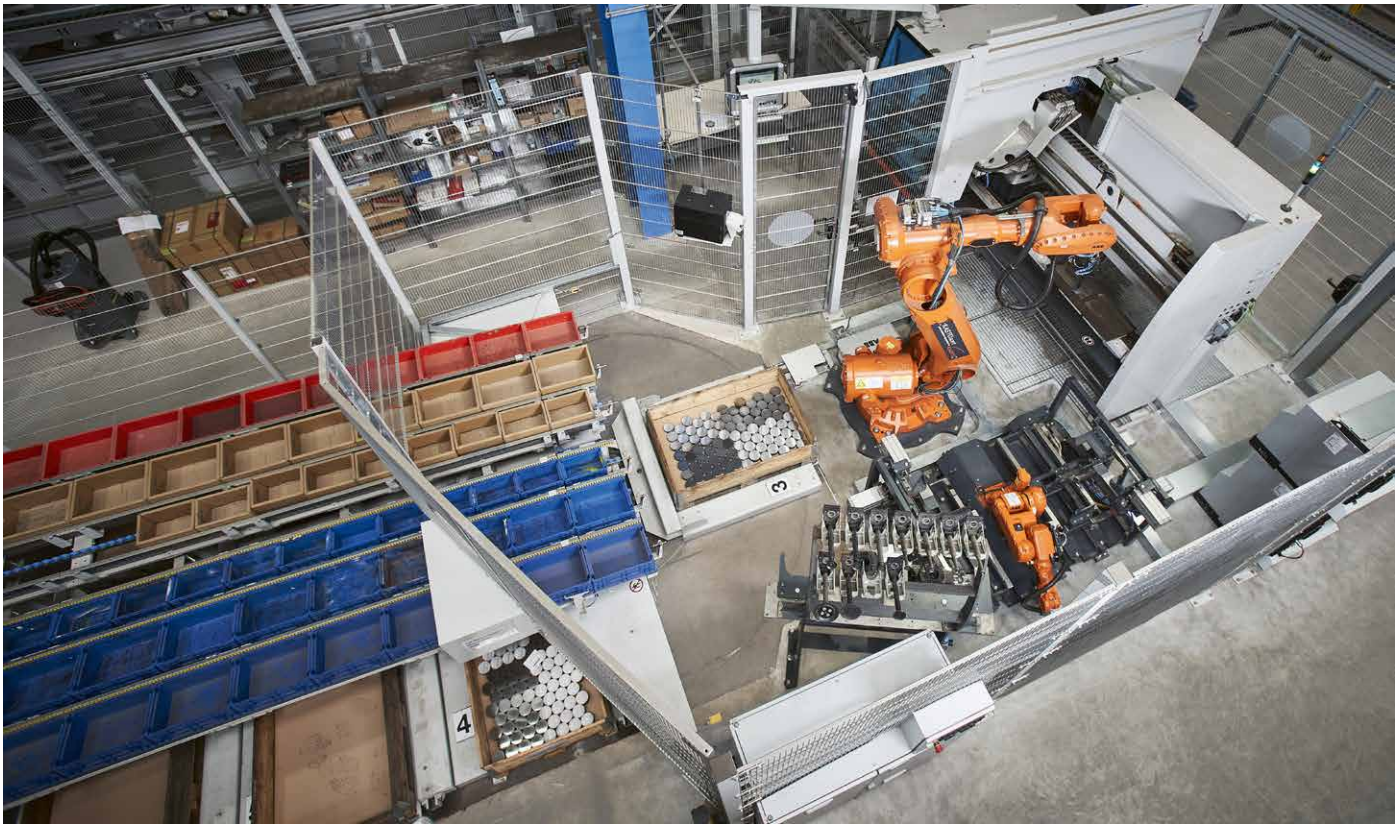
Sawing centre provides fully automatic cut to size

The KASTOcenter and the two fully automated sawing machines enable the steel distributor to automatically cut the materials flexibly and quickly. The KASTOsort robot removes the pieces from the circular saw, a KASTOvariospeed SC 18, and feeds them into a deburring unit as needed. It then sorts them onto the pallets. The pallet rotation unit provides the robot with a load carrier that precisely fits the material to be sorted. In addition, the system continuously feeds and unloads full and empty containers in the loading and unloading zone. An added feature: the robot automatically attaches a barcode to the cut pieces. This ensures that all data is then available digitally. The production control documents are even available on the pallets.

Hagelauer Dewald uses the second machine, a KASTOtec SC 4 band saw, for large dimensions of up to 260 millimetres in diameter. An apron conveyor positions the cut pieces and pushes them to the desired deposit position, either on a closed table surface or pallets.

Customers want flexible and fast supply

"The sawing centre from Kasto is ideal because it fits perfectly with our item-driv-



The robot removes the cut pieces from the saw and sorts them onto the pallets (Picture: Kasto)

en business," explains Jörg Bayer. The steel distributor requires maximum flexibility and speed with 100,000 items and 2.5 million saw cuts per year. He assures there is no doubt that investing in the KASTOcenter varioplus 2 has paid off: "We can now provide our customers the exact materials they need. This saves storage space, and their well-paid specialised personnel no longer has to spend time on storage and sawing tasks," Bayer summarises.

The managing director jokes, "Our customers want to get steel in bags". In fact, machine manufacturers and other steel fabricators order primarily small quantities from Hagelauer Dewald. "Over 60 per cent of all items leave our hall on a single pallet or plastic crate," he adds. The new fully automated sawing centre can easily process many different items without any changeover or dwell times. In summary, Jörg Bayer explains: "This quick availability is a major advancement for us. Anything the customer orders today will be delivered tomorrow – regardless of how small the quantities may be."

KASTO Maschinenbau GmbH & Co. KG

TATA STEEL EUROPE LAUNCHES ECO-FRIENDLY STEEL DELIVERY SERVICE

The service enables steel users to reduce their carbon emissions linked to the transportation of steel.

With the new "Zeremis Delivered®" option, Tata Steel aims to support its customers meeting their scope 3 emission targets. Initially, Zeremis Delivered will be available to customers located within a 300-kilometer driving distance from TSE's sites in the Netherlands and Belgium. Delivery by truck with the use of HVO100 will provide savings of up to 90% of CO_2 compared to conventional fossil fuel. The eco-friendly delivery option will be further developed to include longer range solutions and other modes of transportation, including rail, barge and sea-going vessels. The company partners with logistics suppliers and knowledge centres to pilot innovative solutions across all modalities. This includes testing electric trucks to gain commercial and operational experience and thereby prepare itself to move to full electrification as soon as possible.

Tata Steel Nederland

ALLEIMA RECEIVES ORDERS IN OIL AND GAS SEGMENT

Alleima has received two major orders in the oil and gas segment: for advanced tubes, so-called umbilicals, and for corrosion-resistant OCTG tubes.

The umbilical products will be used in an offshore project in Brazil. Deliveries are scheduled for the second half of 2024 and early 2025. The oil country tubular goods (OCTG) ordered will be used in an offshore project in North Africa. The products are scheduled to be supplied in mid-2024.

"Demand in the energy sector is strong, driven both by growing demand for energy as well as the shift to renewable energy sources. We are well positioned to continue to gain business in this field", says Nigel Haworth, President Business Unit Energy, Tube division.

Alleima

TATA STEEL AND GESTAMP ENTER INTO CIRCULARITY PARTNERSHIP

An agreement between Gestamp and Tata Steel UK will see the percentage of recycled steel in the components they supply to the automotive sector nearly double, as the two companies work to increase the circularity of steel in the automotive supply chain.

Original Equipment Manufacturers need low-emission steel to meet their decarbonisation targets with guaranteed quality and safety. This new circularity concept contributes to achieving sustainability goals by using high-quality scrap as a secondary raw material for the production of low-emissions steel.

Tata Steel's automotive steel grades already include 17 percent recycled content – made up of scrap steel that re-enters the steel production process. The recycled content provided by Gestamp will be additional to the existing recycled content. This new partnership sees the percentage of recycled content associated with the steel provided to Gestamp jump to 30 percent with no impact on quality, strength or formability. This is, in turn, passed on to automotive manufacturers, reducing the overall carbon footprint of their supply chain and production process.

In this new partnership, Gestamp will channel its high-quality scrap to Tata Steel's steelworks in Port Talbot so that it can be used again in future steelmaking. The traceability and quality of pre-consumer scrap provided by Gestamp will enable the recycled content of new steel to be increased and the quality of the steel preserved.

To ensure accountability, Tata Steel will provide evidence to demonstrate the volume of high-quality scrap supplied and the associated CO_2 savings by setting up a Gestamp Recycled Content Bank, which will be independently audited.

Gestamp / Tata Steel

WUPPERMANN INTRODUCES NEW PRODUCT WITH REDUCED CO_2 FOOTPRINT

Wuppermann has recently introduced WTopCarb, its new low-CO_2 product. WTopCarb stands for a galvanized hot-rolled strip with a physical reduction of the CO_2 footprint down to a value of less than one tonne of CO_2 equivalent per tonne of galvanized hot-rolled strip.

Wuppermann makes use of CO_2 saving opportunities provided by the input and raw materials, such as hot strip and zinc, the galvanizing process itself and in transport and packaging. The savings achieved through "physical reduction", i.e. technical measures along the value chain that bring about a reduction in the carbon footprint of the specific product, are documented for each delivery. The CO_2 emissions are calculated per item, using a calculation methodology verified by the Fraunhofer Institute for Environmental, Safety and Energy Technology (UMSICHT). The result is documented in the form of a certificate and sent to the customer. Consequently, with WTopCarb, customers aiming to reduce their carbon footprint receive a CO_2-reduced steel product with accurately calculated physical CO_2 savings.

Wuppermann

THYSSENKRUPP MATERIALS TRADING OFFSETS EMISSIONS THROUGH CLIMATE PROJECTS

thyssenkrupp Materials Trading, a subsidiary of thyssenkrupp Materials Services, offsets the CO_2 footprint of fiscal year 2021/22 with emission reduction certificates.

After carrying out own reduction efforts, the remaining 310 t of CO_2 emissions will be offset with exclusively high-quality carbon removal credits. Each credit corresponds to one ton of permanently removed atmospheric CO_2. By investing in carbon credit projects, thyssenkrupp Materials Trading is making an active and voluntary contribution to the climate goals of the United Nations. This was preceded by the introduction of the Voluntary Carbon Credits Desk (VCC Desk) in spring 2023.

The VCC Desk of thyssenkrupp Materials Trading acts as a central contact point and one-stop shop for high-quality emission reduction certificates for the thyssenkrupp Materials Services companies as well as external customers. Its services include the careful selection, procurement, and transparent and orderly closure of carbon credits. The resulting offsetting is relevant for the company's own carbon footprint as well as for the emissions associated with the customer's trading products.

thyssenkrupp Materials Trading relies on carbon removal credits through innovative technologies – including the production of insulating materials from carbon-neutral cellulose fibers from renewable sources and the reduction of CO_2 emissions through the recycling of thermal waste. The company is also supporting a large-scale conservation project to restore wetlands, which promotes biodiversity and local communities and is in line with twelve of the United Nations Sustainable Development Goals (SDGs).

thyssenkrupp Materials Services

VOESTALPINE SUBSIDIARY ACQUIRES ITALIAN STORAGE SOLUTIONS SUPPLIER

NEDCON, a voestalpine subsidiary based in the Netherlands and supplier of innovative storage solutions, has acquired Italian warehouse and racking specialist Torri S.P.A.

The product portfolio of Torri S.P.A. includes both manual and automatic storage systems, as well as tailor-made solutions designed to meet specific customer needs. The acquisition allows NEDCON to pursue its strategy of offering complex storage systems from a single source, from initial development right through to final assembly.

voestalpine

KLÖCKNER & CO REPORTS BUSINESS RESULTS

Klöckner & Co SE achieved an operating income (EBITDA) before material special effects of 41 million euros in the third quarter 2023. This is at the lower end of the forecast range of 40-80 million euros, but considerably above the result of the prior-year quarter.

The result was driven by the continued positive development in North America and Switzerland. However, due to the ongoing challenging macroeconomic environment, especially in Europe, contrary to the previous forecast of 220-280 million euros, EBITDA before material special effects of 170-200 million euros is now anticipated for the full year 2023. To counteract this in Europe, Klöckner & Co SE has initiated an efficiency program with a planned reduction in the number of employees in the European distribution business by 10 percent with implementation starting in the fourth quarter of 2023. The aim is to achieve a recurring annual improvement in operating income (EBITDA) before material special effects by around 25 million euros by as early as 2024. A strong and significantly positive cash flow from operating activities is still expected for the full year 2023.

Klöckner & Co

KLÖCKNER & CO ACQUIRES INDUSTRIAL MANUFACTURING SERVICES

Klöckner & Co has agreed to acquire Industrial Manufacturing Services (IMS) through its U.S. subsidiary Kloeckner Metals Corporation (KMC). IMS provides fabrication, welding, assembly as well as just-in-time warehousing of light to medium size sub-assemblies to OEMs of the heavy machinery industry.

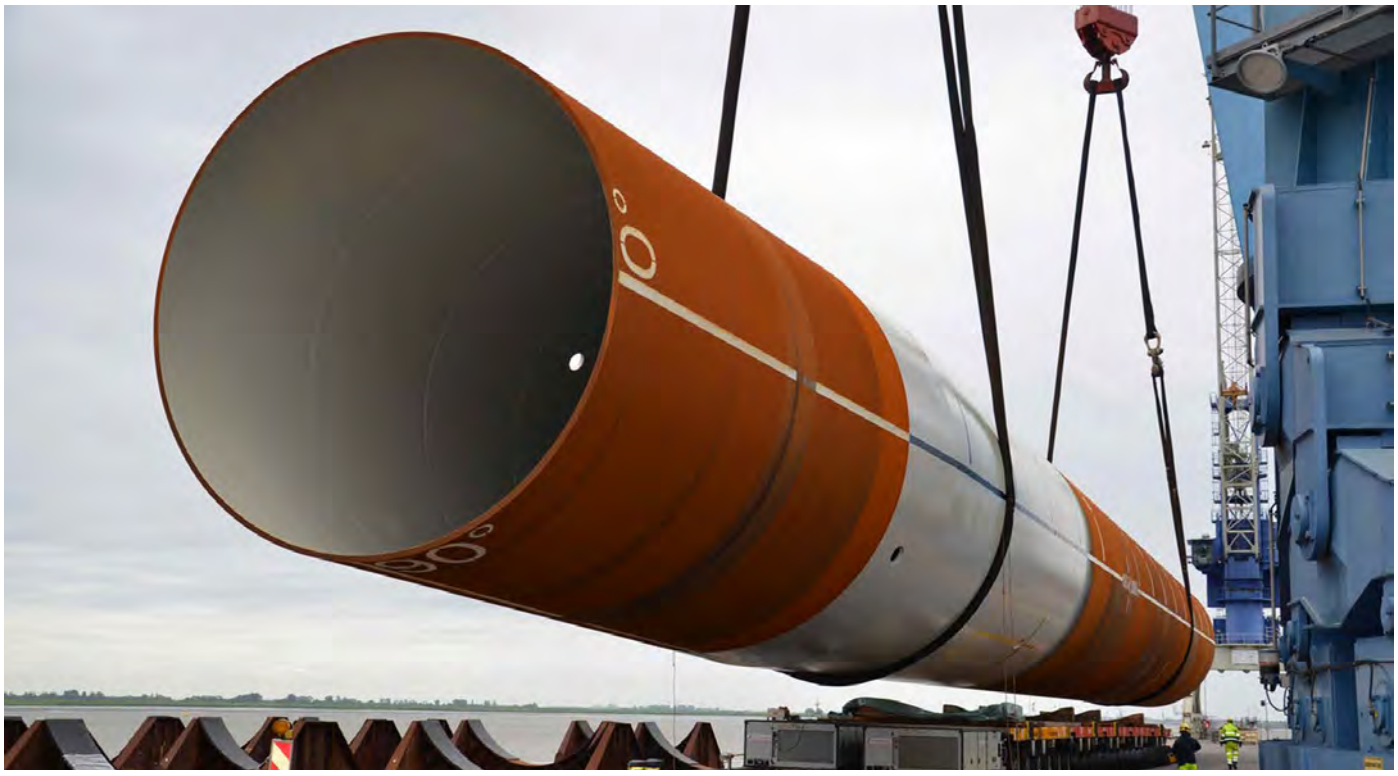
The transaction marks a further milestone in the implementation of Klöckner & Co's corporate strategy. As part of its strategy, Klöckner & Co intends to expand its fabrication portfolio to benefit from the highly profitable fabrication business and from being significantly less dependent on steel price developments. The acquisition of IMS fully contributes to this strategy. Guido Kerkhoff, CEO of Klöckner & Co SE: "The acquisition of IMS is the second significant transaction in just a few months which will accelerate the expansion of our product and service portfolio in line with our corporate strategy 'Klöckner & Co 2025: Leveraging Strengths'." Industrial Manufacturing Services (IMS) operates one facility in Lancaster, South Carolina. The recent acquisition of National Material of Mexico (NMM) by Kloeckner Metals Corporation already made a significant contribution to the strengthening of the company's market position in North America.

Klöckner & Co

OFFICIAL OPENING OF THE HOLLANDSE KUST ZUID

Heavy plate for offshore wind farms

It took just two years to build the world's largest offshore wind farm, Hollandse Kust Zuid, in the Netherlands. All 139 offshore wind turbines are due to go into operation by the end of 2023.



Loading out of a monopile foundation at the operation terminal (Archive picture: Steelwind Nordenham)

The Hollandse Kust Zuid 1-4 offshore wind farm has celebrated its official opening. The wind farm is located between 18 and 36 kilometres into the North Sea off the Dutch coast, between the cities of Scheveningen and Zandvoort.

The farm is built on monopile foundations stretching 62 to 75 meters long and weighing up to 955 tons, in water depths reaching 17 to 28 meters. Dillinger supplied around 115,000 tons of heavy plate for these monopile foundation structures in thicknesses ranging from 54 to 90 mm.

"We are proud to provide an important contribution with our products to another offshore wind farm project and thus to the energy transition," said Danny van der Hout, Dillinger's Chief Sales Officer. "With our highly advanced production processes and wide-ranging service system, we are helping our customers continue accelerating the expansion of green energy."

With 139 turbines and an installed capacity of 1.5 GW, Hollandse Kust Zuid is one of the largest offshore wind farms in the world. It can supply approximately 1.5 million households with renewable energy each year.

During construction of Hollandse Kust Zuid 1-4, the natural surroundings were also included for the first time in the design of the wind farm. These measures include enlarged water holes in the foundation elements that provide shelter for marine life inside the turbines as well as boulders and stones of various sizes that were used to construct the scour protection. Artificial rocky reefs have been created on several scour protection systems to make them more attractive to a greater number of fish, crabs, and crustaceans.

Dillinger

> We are helping our customers continue accelerating the expansion of green energy.
>
> *Danny van der Hout, Chief Sales Officer at Dillinger*

SUSTAINABILITY IN CONSTRUCTION

First building with fossil-free steel

The wall and roof structures have been designed and produced by Ruukki Construction. Parts of the building were manufactured using fossil-free steel from SSAB.

Fossil-free steel has been used for the sandwich panels (Picture: Anna Malm)

Peab is now the very first construction company to use fossil-free steel in a construction project. The building in Hasslanda in Lund (Sweden) is an industrial facility covering 6,000 square meters. The fossil-free SSAB steel has been used in the production of sandwich panels made by Ruukki Construction in Finland for parts of the building walls. Property owner Wihlborgs is the customer and developer, and the tenant will be contract manufacturer Inpac.

"We're extremely proud to be part of a historic shift for our industry. The building is a starting point for work to reduce the climate impact in the steel industry on a broad front. It's a real community building project and, together with Ruukki and SSAB, Peab is now further strengthening itself to meet its customers' growing demands for more sustainable material choices," says Jesper Göransson, CEO of Peab.

"It's amazing to see what great steps forward can be taken with sustainable development when it's done together with others – the project with Peab and Ruukki shows what is actually possible right now. For SSAB, it's not just about reducing our own emissions with fossil-free steel, but also about contributing to reducing the carbon footprint in other parts of the value chain," says Christina Friborg, Head of Sustainability at SSAB.

"This project is an excellent example of how going forward we can revolutionize construction together with our customers. We're proud to be involved in driving the construction industry forward with our products that are not only made with fossil-free steel, but also developed with sustainability and the entire life cycle impact of the product in mind," says Sami Eronen, President of Ruukki Construction.

"We can only achieve the industry's goal of climate neutrality if we collaborate and together develop products and buildings that make a real difference. This project is an important step in this direction, and as the customer we have a major responsibility to constantly raise the level of our own requirements, so that the entire chain is characterized by high sustainability ambitions," says Ulrika Hallengren, CEO of Wihlborgs.

The construction and civil engineering industry aims to reach climate neutrality by 2045, which requires the use of new materials and products with a low climate impact on a broad front. SSAB steel manufactured using HYBRIT technology will be on the market in 2026, enabling companies in the construction sector to drastically reduce carbon dioxide emissions in the steel segment. HYBRIT technology means that iron ore is directly reduced using hydrogen and fossil-free electricity, as opposed to coal and coke, which are used in a blast furnace process. The residual product is then water rather than carbon dioxide.

Peab, through its partnership with SSAB, and Ruukki Construction, as a subsidiary of SSAB, have both secured access to fossil-free steel and intend to use it in future projects from 2026. The new steel will contribute to long-term sustainable growth in the sector and be an important element in the climate transition for the whole of Sweden.

Between them, the construction and real estate sectors currently account for about one fifth of Sweden's domestic carbon dioxide emissions. In new construction, the manufacturing of materials and products accounts for the vast majority of climate impact. Developing the world's first building using fossil-free steel is therefore a milestone for the entire industry.

SSAB

Cronimet is the first scrap supplier partner joining the Inner Circle initiative (Picture: Outokumpu)

FIRST-OF-ITS-KIND INITIATIVE

Enabling a circular economy for a more sustainable future

Outokumpu has started a new circularity initiative, Outokumpu Inner Circle, to strengthen the circular economy in Europe. The initiative was launched at the World Circular Economy Forum in Helsinki, Finland, in summer.

The Inner Circle initiative aims to bring transparency to supply chains and smoothen the path from stainless steel to usable scrap, and from scrap to ever more sustainable stainless steel production – ultimately creating a closed loop for steel scrap. This initiative is the first of its kind for the industry.

"Circularity is one crucial element of sustainable stainless steel production. With the Inner Circle initiative, we are bringing our customers and scrap suppliers together to ensure an efficient, transparent, and sustainable supply chain for steel scrap. Ultimately, our vision is to create a visible closed loop for steel – a unique example of circular economy in action," explains Max Menzel, Head of Sustainability & Technical Customer Service at Outokumpu.

By using existing, efficient supply chains, the ways for the scrap from customers back to the producers can be shortened. Transparency and ESG conformity throughout the supply chain will be ensured by verifying all partners within this initiative.

In the initiative, Outokumpu's role is to steer the initiative and create networks between customers and verified scrap suppliers. The scrap suppliers' role is to ensure a sustainable supply chain by providing scrap from the network's partners and to distribute the scrap sustainably. Customers who join the program will bring their scrap back into the cycle after processing the material or by the end of the product's life cycle via the scrap suppliers.

"Together we will show strong initiative and leadership by spearheading the move

towards a more circular and a closed-loop economy. Our partners can join this unique and open initiative, which is the first in the industry, and demonstrate their leadership and contribution to the circular economy," says Max Menzel.

Outokumpu's partners can now join this groundbreaking initiative and demonstrate their leadership in circular economy to customers and stakeholders. The first partners will be able to give their input to the creation and development of the network to genuinely add value to the industry's efforts in sustainability.

"Outokumpu Inner Circle is an open initiative where we would like to welcome all scrap suppliers and stainless steel consumers from Europe to participate. We are now entering the first phase of this initiative and I'm happy to announce CRONIMET as the first scrap supplier partner joining us. At this stage, our focus is on creating the practices and learning about the co-operation. There's been a lot of interest already, showing that there really is an industry-wide need for this kind of an initiative," says Max Menzel.

"The Inner Circle initiative builds on the ideas of fairness, openness and the pursuit of long-term partnerships and therefore fits perfectly with our corporate values. At the same time, we are convinced that this is the right approach to achieving sustainability and business success in the circular economy," says Nico Krueger, Commercial Director at CRONIMET.

> Our vision is to create a visible closed loop for steel – a unique example of circular economy in action.
>
> *Max Menzel, Head of Sustainability & Technical Customer Service at Outokumpu*

For Outokumpu, circular economy is at the heart of its sustainability approach. As a material, stainless steel is a key ingredient of circular economy as it is 100% recyclable. Already today, Outokumpu has the highest recycled material content rate in the stainless steel industry at 94%.

"We believe the world does not need more things – but things that last. And when a product is at the end of its life cycle, it should be brought back to life by becoming raw material for something new. The more we use scrap, the lower our emissions are. We would like to enable our customers and partners to actively participate by joining this initiative," says Juha Erkkilä, VP – Sustainability, Outokumpu.

Outokumpu

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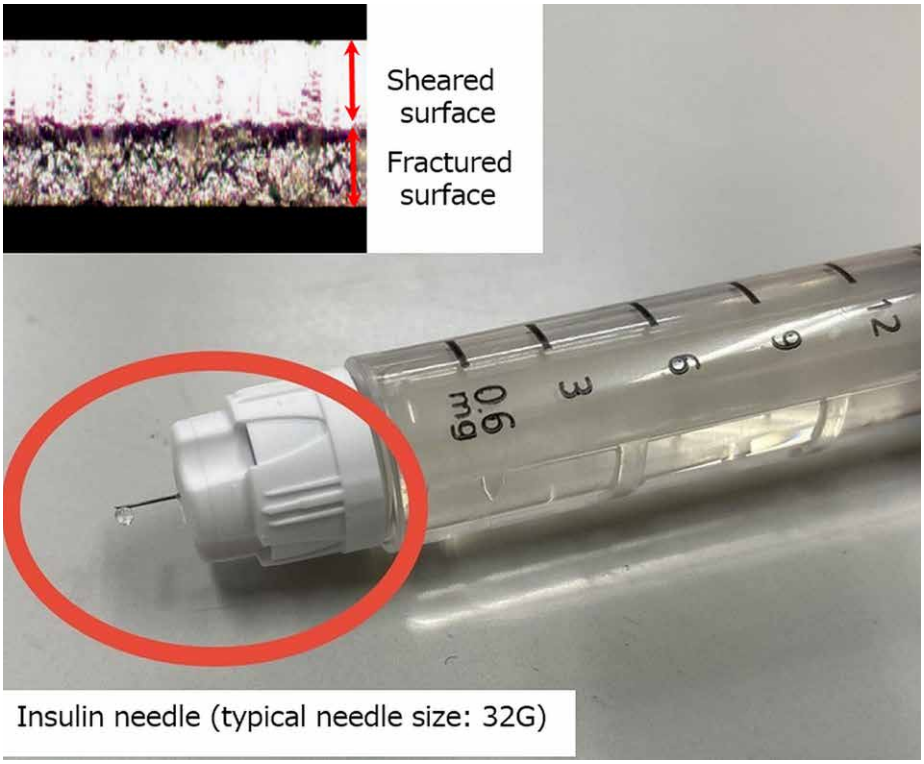
ADVANCED STAINLESS STEEL FOR MEDICAL USE

Low-cobalt materials for injection needles

Leading manufacturer of materials for injection needles Nippon Kinzoku starts exporting stainless steel grade NK-304LCO that complies with the European Medical Device Regulations on low cobalt content



Insulin needle and cut face of the strip edge after slitting (Picture: Nippon Kinzoku)

Japanese steel manufacturer Nippon Kinzoku Co., Ltd. has recently announced to make progress in expanding sales of low-cobalt stainless steel materials to overseas markets. Volumes are currently increasing slightly due to the regulatory approach of individual medical manufacturers, but enquiries from the European and Chinese markets are increasing and sample shipments have already begun.

The company commercialized NK-304LCO grade stainless steel for injection needles in November 2020, which is compliant with the cobalt composition regulation of the European Medical Devices Regulation (MDR - see below).

The conventional stainless steel previously used for injection needles (NK-304NKM) was difficult to adapt to this regulated low cobalt content. But in response to requests from medical device manufacturers, Nippon Kinzoku succeeded in alloy design as a result of discussions with raw material suppliers. The company was able to successfully manufacture the stainless steel strip with low cobalt content. Currently, Nippon Kinzoku has started selling the amount equivalent to approximately 3% of the cobalt-regulated materials for customers using their stainless steel material for injection needles.

Stainless steel grade NK-304NKM, which is the base of NK-304LCO (LCO: low cobalt), is a steel grade developed on the premise of versatility in forming by medical device manufacturers. The NK-304NKM has been selected as the material of choice for "thin diameter" types of needles for insulin such as "painless needles" and cosmetic applications and is currently being used all over the world.

Demanding strip processing

The following material characteristics are particularly important for the manufacturing process.

Processability without rupture. Injection needles are manufactured by welding the edges of the roll-formed strip and then stretching the raw tube into a thin tube. For insulin, for example, a raw tube with a diameter of 4.0 mm and a wall thickness of 0.2 mm is drawn, then heat-treated and drawn many times in turn, until it is drawn to an outer diameter of 0.18 mm and a wall thickness of 0.05 mm.

Stability of the seam. The second feature is the stability of the welded part (seam) of the bare tube. This feature is related to the cutting surface of edges (i.e. the slit strip), that are welded to get the bare tube. The seam shall not rupture even when thinly drawn. The ratio between the fractured and sheared part of the cutting surface (50% sheared surface and 50% fractured surface) is agreed to facilitate welding by medical device manufacturers. The same edge properties (cut face) are supplied for the entire coil length (at wall thickness of 0.2 mm: approx. 4,000 metres).

NK-304LCO stainless steel for injection needles is within the SUS304 composition of the Japanese Industrial Standards (JIS) and the American Iron and Steel Institute (AISI) standards, suppresses work hardening and increases processing performance.

The European Medical Devices Regulation (MDR) , which came into effect in May 2021, is a regulation for marketing medical devices in Europe and is a stricter approval system than the existing Medical Device Directive (MDD). The MDR stipulates the Regulation on Classification, Labeling and Packaging of substances and mixtures (CLP), which targets the cobalt (Co) component contained in stainless steel as a carcinogen. It is less than 0.1%. The complete transition to MDR has been postponed from the original May 2024 to December 2028.

Nippon Kinzoku

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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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1698 Steel mill plants and equipment

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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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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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04.08 Tertiary metallurgy

2144 Vacuum degassing equipment

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04.09 Components

2150 Deslagging machines

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2175 Burning machines for ladles

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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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2440 Handling equipment for oxygen/carbon lances

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2490 Coal dust injection lances

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2530 Lance robots/-manipulators

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2600 Oxygen lance equipment

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2660 Special safety oxygen hose reels

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04.10 Steel works materials

2735 EBT taphole plugging compound

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2880 Ladle slide sand

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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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Glama Maschinenbau GmbH
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5155 Forging manipulators, rail-mounted

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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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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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8205 Laser welding machines

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8210 Laser beam welding machines

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8220 MIG, MAG and TIG\057TIG welding torches

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8257 Rolling seam resistance welding equipment

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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

LOI Thermprocess GmbH
Schifferstraße 80
47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

10430 Bogie hearth furnaces

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Schifferstraße 80
47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
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Internet: www.loi.tenova.com

10460 Chamber furnaces

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Schifferstraße 80
47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

10510 Roller hearth and walking beam furnaces

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47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

10540 Pusher-type, roller and rotary hearth furnaces

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Schifferstraße 80
47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

10560 Heat treatment plants

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Schifferstraße 80
47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

10562 Heat treatment furnaces (continuous and discontinuous)

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Schifferstraße 80
47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

10570 Heat treatment furnaces for batch operation, open heated

LOI Thermprocess GmbH
Schifferstraße 80
47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

16.09 Bath furnaces

10580 Aluminum melting furnaces

LOI Thermprocess GmbH
Schifferstraße 80
47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

16.13 Components

10890 Natural gas burners

WS Wärmeprozesstechnik GmbH
Dornierstr. 14
71272 Renningen, Germany
☎ +49 7159 1632-0
🖷 +49 7159 2738
E-Mail: ws@flox.com
Internet: www.flox.com

11010 Regenerative burners

WS Wärmeprozesstechnik GmbH
Dornierstr. 14
71272 Renningen, Germany
☎ +49 7159 1632-0
🖷 +49 7159 2738
E-Mail: ws@flox.com
Internet: www.flox.com

11020 Recuperative burners

WS Wärmeprozesstechnik GmbH
Dornierstr. 14
71272 Renningen, Germany
☎ +49 7159 1632-0
🖷 +49 7159 2738
E-Mail: ws@flox.com
Internet: www.flox.com

11070 Radiant tube burners

WS Wärmeprozesstechnik GmbH
Dornierstr. 14
71272 Renningen, Germany
☎ +49 7159 1632-0
🖷 +49 7159 2738
E-Mail: ws@flox.com
Internet: www.flox.com

18 Machinery and plant engineering

12210 Plant engineering, general

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47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

18.06 Ventilation plants and equipment

12660 Air conditioners for heat plants

FrigorTec GmbH
Hummelau 1
88279 Amtzell, Germany
☎ +49 7520 914820
E-Mail: info@frigortec.com
Internet: www.frigortec.com

12670 Air conditioners for crane lances, crane bridges, etc.

FrigorTec GmbH
Hummelau 1
88279 Amtzell, Germany
☎ +49 7520 914820
E-Mail: info@frigortec.com
Internet: www.frigortec.com

18.10 Power and work machines

13070 Piston pumps

HYDROWATT AG
Freistrasse 2
8200 Schaffhausen, Switzerland
☎ +41 52 624 53 22
🖷 +41 52 625 62 11
E-Mail: info@hydrowatt.com
Internet: www.hydrowatt.com

13160 Vacuum pumps

LOI Thermprocess GmbH
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47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

21 Measuring and testing technique

21.01 Measuring and testing technology, general

16510 Measurement technology

PROMECON process measurement control GmbH
Steinfeldstr. 5
39179 Barleben, Germany
☎ +49 39203 512-0
🖷 +49 39203 512-202
E-Mail: info@promecon.com
Internet: www.promecon.com

16520 Measuring and testing systems, general

PROMECON process measurement control GmbH
Steinfeldstr. 5
39179 Barleben, Germany
☎ +49 39203 512-0
🖷 +49 39203 512-202
E-Mail: info@promecon.com
Internet: www.promecon.com

21.02 Measurement of physical properties

16830 Speed measuring devices

POLYTEC GmbH
Polytec-Platz 1-7
76337 Waldbronn, Germany
☎ +49 7243 604-0
🖷 +49 7243 69944
E-Mail: info@polytec.de
Internet: www.polytec.de

16910 Length measuring devices for tubes

POLYTEC GmbH
Polytec-Platz 1-7
76337 Waldbronn, Germany
☎ +49 7243 604-0
🖷 +49 7243 69944
E-Mail: info@polytec.de
Internet: www.polytec.de

16960 Laser speed and length measuring systems

POLYTEC GmbH
Polytec-Platz 1-7
76337 Waldbronn, Germany
☎ +49 7243 604-0
🖷 +49 7243 69944
E-Mail: info@polytec.de
Internet: www.polytec.de

24 Environmental protection and disposal

24.01 Dedusting and gas cleaning

18360 Exhaust gas cooling systems

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Schifferstraße 80
47059 Duisburg, Germany
☎ +49 203 80398-900
🖷 +49 203 80398-901
E-Mail: loi@tenova.com
Internet: www.loi.tenova.com

18400 Treatment of dusts from steel mills and foundries

Maschinenfabrik
Gustav Eirich GmbH & Co KG
Walldürner Str. 50
74736 Hardheim, Germany
☎ +49 6283 51-0
🖷 +49 6283 51-325
E-Mail: eirich@eirich.de
Internet: www.eirich.de

List of Products

01 Raw materials, auxiliary materials and operating materials

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

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

01.03. Scrap
120 Scrap metal

01.04. Sponge iron
128 Sponge iron
130 Sponge iron

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

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

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

01.08. Lubricants
680 Coating powder
690 Lubricants

01.09. Composite materials
678 Bimetal for saws

01.10. Water
691 River water / additional water

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

02 Raw material pretreatment

700 Engineering and technical assistance
703 Engineering and project management

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

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

02.03. Coal burden preparation
790 Coal burden preparation

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

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

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

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

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

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

03 Iron making

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

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

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

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

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

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

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

04 Steelmaking

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

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

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

04.03. Energy optimization furnaces
1770 Energy optimization furnaces

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

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

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

04.07. Secondary metallurgy

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

04.08. Tertiary metallurgy

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

04.09. Components

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

04.10. Steel mill supplies

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

04.11. Preparation of steel mill materials

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

04.12. Services

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

05 Continuous casting

2960 Engineering and technical assistance

05.01. Continuous casting plants of various designs

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

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

05.02. Continuous casting plants for different product dimensions

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

05.03. Spray compacting plants

3090 Spray compacting plants

05.04. Components

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

05.05. Operating materials

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

05.06. Services

3537 Grinding and scarfing of slabs, billets and blooms

06 Near net shape casting

3540 Engineering and technical assistance

06.01. Equipment

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

06.02. Components

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

06.03. Operating supplies

3750 Coolant
3760 Lubricants

07 Hot rolling

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

07.01. Hot strip mills

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

07.02. Heavy plate mills

3850 Hot rolling mills, complete

07.03. Billet and semi-finished product mills

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

07.04. Section mills

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

07.05. Bar and wire rod mills

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

07.06. Ring rolling mills

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

07.07. Finishing lines

3990 Finishing lines
4000 Finishing machines

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

07.08. Rolls for hot rolling mills

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

07.09. Roll machining and machines

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

07.10. Components

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

07.11. Operating fluids

4900 Lubricants for hot rolling mills

07.12. Services

4920 High wear resistant coating on rolls etc.

08 Forging, extrusion

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

08.01. Forging machines

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

08.02. Extrusion presses

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

08.03. Components

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

08.04. Operating materials

5190 Lubricants for extrusion presses
5195 Heat resistant sliding materials

09 Powder metallurgy

5200 Engineering and technical assistance
5210 Powder Metallurgy

09.01. Hard alloys

5220 Hard alloys, general
5230 Machinable and hardenable hard alloys

09.02. Hard materials

5290 Tungsten carbide

09.03. Hard metal powders

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

09.04. Additives

5320 Binder metals
5330 Organic additives

09.05. Machines and equipment for powder production

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

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

09.07. Powder metallurgy manufactured products
5430 PM metals / sintered metals
5432 PM rolling rings
5440 PM steels
5450 Composite materials

09.08. Further processing of powder metallurgy products
5460 Plasma powder cladding
5470 Thermal spraying

09.09. Additive manufacturing
5475 3-D printing
5476 Additive manufacturing processes

10 Cold rolling

5480 Engineering and technical assistance

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

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

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

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

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

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

10.07. Operating materials
5960 Lubricants for cold rolling

11 Surface treatment

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

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

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

11.03. Grinding and polishing machines
6210 Belt grinding machines
6230 Centrifugal grinding plants
6240 Polishing plants
6250 Drag grinding plants

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

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

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

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

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

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

11.09. Services
6906 Large format surface grinding
6910 Contract finishing

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

12 Production of bright steel and wire

6920 Engineering and technical assistance
6925 Second-hand equipment

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

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

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

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

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

13 Production of tubes / pipes

7290 Engineering and technical assistance
7295 Second-hand equipment

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

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

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

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

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

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

14 Sheet metal processing

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

14.01. Plants, presses, machines

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

14.02. Slitting lines

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

14.03. Welding technology

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

14.04. Components

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

14.05. Services

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

15 Steel products

15.01. Rolled steel

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

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

15.02. Pipes

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

15.03. Forgings

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

15.04. Railroad rolling stock

9540 Axles
9550 Wheel tires

15.05. Steel in the following delivery forms

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

15.06. Drawing and cold rolling mill products

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

15.07. Wire and wire products

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

15.08. Steel construction

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

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

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

16 Furnace and energy technology

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

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

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

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

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

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

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

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

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

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

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

16.11. Protective gas plants
10670 Protective gas plants

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

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

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

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

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

17 Refractory technology

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

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

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

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

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

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

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

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

18 Machinery and plant engineering

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

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

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

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

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

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

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

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

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

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

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

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

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

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

18.14. Control systems and components
13680 Shut-off valves

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

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

18.16. Stranding machines
13955 Stranding machines
13958 Rope making machines

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

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

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

18.20. Clamping technology
14380 Clamping hydraulics
14400 Clamping elements
14401 Clamping tools, screws

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

18.22. Operating fluids
14500 Solid lubricants
14510 Industrial oils
14520 Cooling lubricants

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

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

19 Transport and storage technique

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

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

19.02. Rail vehicles
14650 Diesel locomotives
14660 Railroad wagons
14670 Self-propelled wagons

19.03. Track technology
14680 Turntables and transfer cars
14684 Track technology
14690 Shunting systems

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

19.05. Continuous conveyors
14830 Conveyors (general)

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

19.06. Cranes

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

19.07. Scales

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

19.08. Storage and retrieval systems

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

19.09. Warehouse organization

15198 Labels
15200 Identification
15208 Warehouse logistics
15210 warehouse organization)

19.10. Components

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

19.11. Operating materials

15660 Lubricants

19.12. Packaging technology

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

20 Electrical engineering and automation

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

20.01. Electrical equipment for metallurgical plants and rolling mills

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

20.02. Control and automation systems

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

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

20.03. Data processing

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

20.04. Software

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

20.05. Maintenance

16450 Machine diagnostics
16460 Maintenance and inspection

21 Measuring and testing technique

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

21.01. Measuring and testing technology, general

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

21.02. Measurement of physical properties

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

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

21.03. Quality management

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

21.04. Quality control

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

21.05. Services

17470 Metrology services

22 Materials testing

17473 Destructive and non-destructive materials testing

22.01. Non-destructive materials testing

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

22.02. Strength testing, endurance testing

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

22.03. Technological testing methods, testing service

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

22.04. Destructive material testing

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

22.05. Fatigue testing

17896 Testing of safety valves in operating condition

22.06. Damage analysis

17898 Damage analysis

23 Analysis and laboratory equipment

17900 Engineering and technical assistance

23.01. Sampling and sample preparation

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

23.02. Analytical equipment

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

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

23.03. Laboratory equipment, general

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

23.04. Metallography

18290 Services
18300 Metallography equipment
18310 Metallographic laboratories
18320 Metallographic testing

24 Environmental protection and disposal

18330 Consulting and measurement
18340 Engineering and technical assistance

24.01. Dedusting and gas cleaning

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

24.02. Waste water treatment

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

24.03. Regeneration plants

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

24.04. Recycling and waste disposal

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

24.05. Components

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

24.06. Operating materials

19170 Activated carbon
19180 Lignite coke
19190 Oil binder
19200 Lubricants

24.07. Services

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

25 Occupational safety and ergonomics

25.01. Occupational safety

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

25.02. Noise protection devices

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

26 Other products

19440 Aluminium and zinc slug production

26.01. Foundry products

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

27 Consulting, planning and services

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

28 Steel in civil engineering

28.01. Software for building and construction

20050 Cad software

28.02. Steel in building construction

20058 Structural steel
20070 Hall gates
20086 Pipelines

28.03. Steel in civil engineering

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

30 Service concerning steel materials

20135 Processing services

30.01. Joining

20178 Soldering

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STEEL TECHNOLOGY

World's first 3-strand slab caster in operation

Paving the way for significant CAPEX and OPEX savings, a unique 3-strand continuous slab caster has been commissioned at Chinese steel producer Tangshan Donghua. The 3-strand plant achieves significantly higher production capacity than a 2-strand caster, while occupying significantly less space than the comparable conventional configuration of two continuous casters, with OPEX benefits resulting from the operation and maintenance of only one continuous casting machine.

Data-supported image processing for the detection and evaluation of surface defects of flat steel products

An innovative process based on automated, camera-assisted surface inspection has been developed and introduced into production for the early detection and processing of surface series defects of flat steel products. It is capable of recognising even difficult-to-identify serial defects in pre-assemblies. With this system, quality managers can initiate early and proactive measures to reduce or avoid quality costs.

Reversing cold mill enables high-end production of silicon steel and AHSS products

A 2-stand reversing cold rolling mill has commenced operations at thyssenkrupp Steel enabling the company to manufacture harder and thinner flat steel products used in cars and motors for electrical vehicles. It is the world's first plant of this kind featuring leading silicon steel technology Hyper UCM significantly boasting production output compared to a single-stand mill.

STEEL DISTRIBUTION

Benteler introduces new brand for CO_2-reduced products

Benteler's Steel/Tube division has combined its CO_2-reduced steels and steel tube products under a uniform and memorable product brand. The eco-friendly labelled products will be offered in three sustainability categories: Advantage, Ambition and Excellence. These indicate how steels and tubes were produced and which energy sources were used for them. The first CO_2-reduced hydraulic line tubes were delivered in November to a manufacturer of agricultural and construction machinery in Germany.

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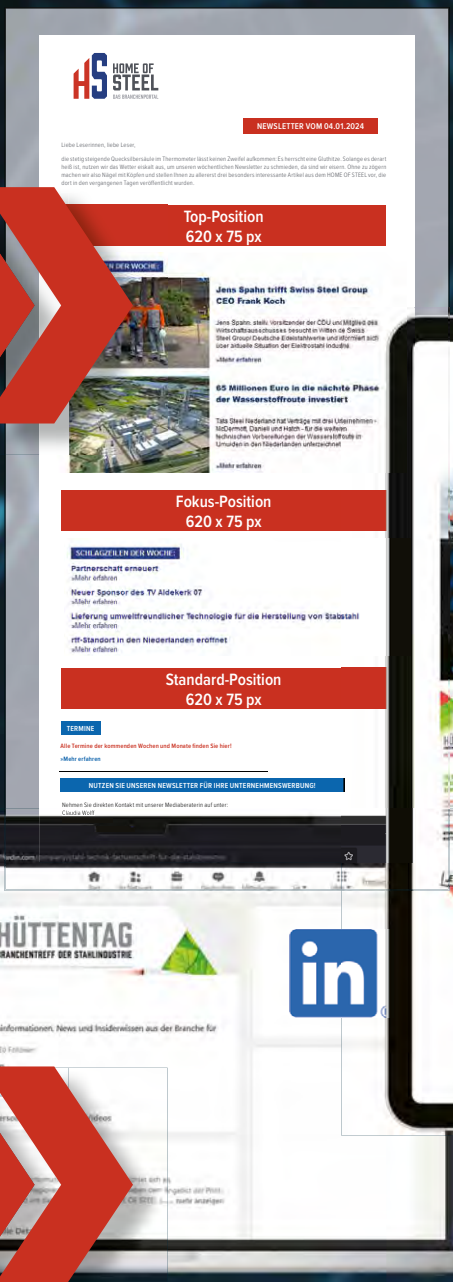

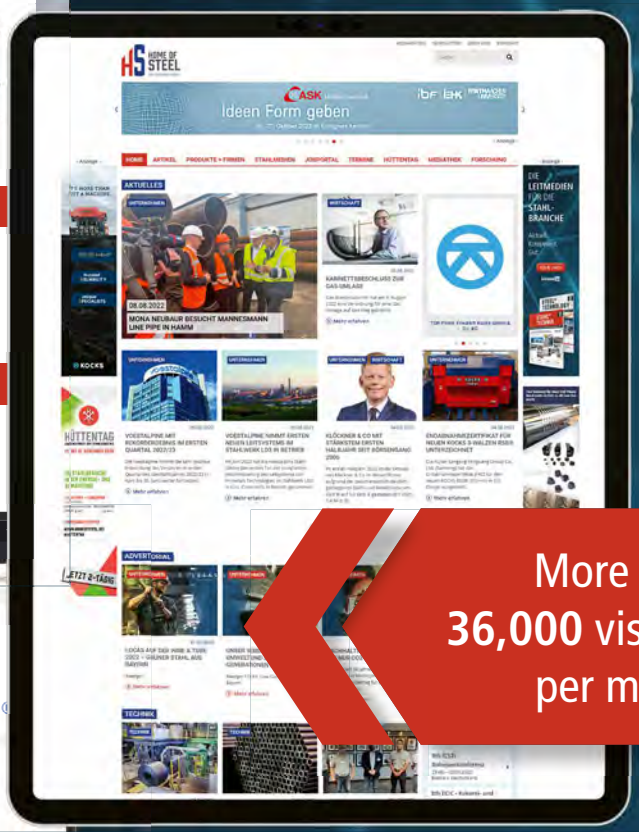

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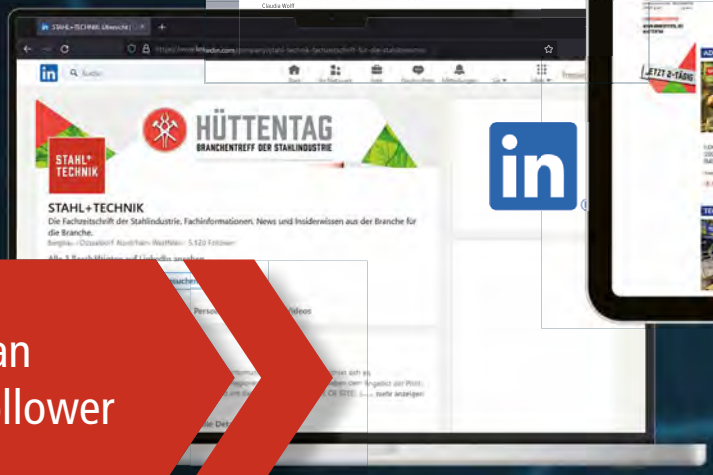

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- CO_2 savings
- Cost savings due to lower emission costs
- Multipoint-Injection-Process ($MPI_{Pat.}$)
- Foamy slag practice
- Closed System, minimum environment pollution

Further Technologies

- **Carbon Multipoint-Injection Process** ($MPI_{Pat.}$) for foamy slag practice
- **Lime Injection Systems**
- **Top-Injection-Process** ($TIP_{Pat.}$) at LF and ladle for carburizing or alloying without refractory lance
- **Slag Suppression Systems** for slag volume reduction
- **Aluminum Injection Systems** for deoxidation
- **Desulphurization Technology** for Steel & Pig Iron
- Development of specific customized process technologies
- Complete service from design to start-up
- Long lifetime **ceramic lined products**, i.e. flexible ceramic lined hose
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