SMS group

newsletter

THE SMS GROUP MAGAZINE
JUNE 2022

IN FOCUS

Your partner for the megatrends

At the Tube & wire, SMS group presents solutions to the major challenges of the entire metals industry – not only the tube and wire sector.

Tube & wire
Visit us in
Hall 7a,
Booth B04

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In focus

At the Tube & wire, SMS group is going to present solutions to the megatrends

Integrated Services

TUBE & WIRE 2022
June 20 to 24, 2022
Hall 7a, Booth B04
Düsseldorf, Germany

Green Metals

Circular Economy

Projects

Innovations

Standards

The **SMS group connect app** is available in the App Store and at Google play.

Google play
Available on the App Store

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Be our guest

Dear friends of SMS group,

Expectations will be high when the trade shows for the tube and wire industry open their doors in Düsseldorf from June 20 to 24, 2022, drawing international experts from all over the world. What's new in the wire and tube sector? Where are current trends heading? How can we increase flexibility to be prepared for the growing dynamics of the markets in the face of high cost pressure? How stable are international supply chains in the mechanical and plant engineering industry as a consequence of the global crises? Thanks to its corporate structure with a clear focus on regional presence, SMS group is able to respond flexibly to the requirements of its customers despite global transport difficulties and supply bottlenecks. Our manufacturing facilities and service workshops are located close to the major steel and metal producing regions of the world. Our employees are right there in the local markets to implement new plant and efficient modernization concepts.

Decisive quality advantages

The tube and wire industries benefit from the fact that we know their materials, their products and their highly complex production processes. Only this ensures that our customers can rely on always receiving latest, innovative technology that secures their leading position in the market. In wire rod mills, we will continue to push the process of billet hot charging with the aim to reduce or even eliminate the use of reheating furnaces. In this way, we can combine gas-free production of green steel with low CO_2 and NO_x emissions. When it comes to corrosion protection, durability and mechanical resistance of pipes, thermal coatings have been moving more and more into focus. Our latest PERFECT jet spray gun models provide plant operators decisive quality advantages in production. Whereas PERFECT jet 2000 is particularly suited to coat large structures, as for example wind turbines for use in offshore parks, the PERFECT jet 401 model is designed for coating the welded seams of ERW profiles (Electric Resistance Welding). Both applications will be demonstrated at the trade fair.

Exciting topics

We look forward to welcoming you – finally in person again - at the SMS group booth in Hall 7a. At our 400-square-meter stand, we are presenting latest innovations and developments in the SMS product portfolio and will be discussing with our guests solutions and suggestions on how to deal with current challenges. Also this time, we can expect exciting insights from our customers and other industry experts: In our "Leading Partner Talks", best-practice solutions will be spotlighted by renowned specialists from industry. Our inspiring discussions after the presentations are among the things I have missed most during the time when we could not have any trade shows due to the Covid pandemic.

Yours,

Burkhard Dahmen
Chairman of the Managing Board
SMS group

Much to offer

INTERVIEW

At its booth, SMS group will present solutions to the challenges involved in the production process.

Worldwide tube and wire manufacturers are striving to operate at maximum efficiency, optimize operational costs and reduce downtimes without compromising productivity and high quality results. At the same time, megatrends such as energy efficiency, resource optimization, recycling and digitalization are increasing the pressure on manufacturers. Dr. Thomas Maßmann, Excecutive Vice President Long Products, talks about how SMS group accompanies its customers and partners in these difficult times and how this affects the trade fair presence at this year's Tube & wire.

The Tube & wire trade fair will take place again from June 20 to 24, 2022. What can visitors expect to see in Düsseldorf?

Dr. Thomas Maßmann: Of couse, we will present our latest developments at the trade fair. However, we are aware of the fact, that equipment alone is no longer the only thing that gives our customers a competitive advantage. Therefore, we combine modern plant technology with intelligent automation and digitalization and innovative service models. The aim is to enable future prospects and, at the same time, to pick up each customer exactly where he is.

Can you give us an example?

Of course. Our thread cutting machine TCG is designed specifically for threading oilfield tubulars in harsh pipe mill environments. Nevertheless, international standards like API or GOST and proprietary premium thread requirements demand for a thorough and end-to-end quality control of the threads. In the past, dimensional examinations were performed manually and represented a time-consuming challenge. That's why we expanded our portfolio by a thread measurement system, the so-called ThreadView, which can be fully integrated into the thread cutting line. ThreadView is the first system enabling manufacturers to automatically measure the negative flanks of premium threads. It is the missing element in the realization of a complete Digital Twin of the thread. In conjunction with our Quality Execution System (QES), the entire genealogy can also be tracked. QES captures and pools all quality data of the various process stages. The software monitors, records and ensures product and process quality along the whole production chain – from the raw material to the surface-finished final product. This is where the combination of equipment and digitalization becomes a real added value.

You also mentioned innovative service models, what's behind it?

Right, for us, there is also a third component to the concept of success. In addition to modern technology and smart digital solutions, we also offer to form long-term partnerships by applying performance-based business models. One example is the Equipment-as-a-Service (EaaS) solution. This means the customer simply orders the service instead of investing in technology, and SMS ensures the service is always ready for use. Applying this concept to Thread View means customers do not have to buy the system but order the measurement service. This gives the customer flexibility in CAPEX and transparency in OPEX.

How does this affect traditional services?

GBasically, not at all. We do not only offer classical services, but are also expanding them. The as-a-service concept is just one element. Let's take the coating service as an example. We merged our worldwide coating know-how in the new Coating Competence Center (CCC) with its headquarters in Mönchengladbach, Germany. Here, our existing coating sites around the globe are linked via a central unit, with the aim to network and support. The CCC sees itself as a flexible partner who delivers

"We combine modern plant technology with intelligent automation, digitalization and innovative service models."

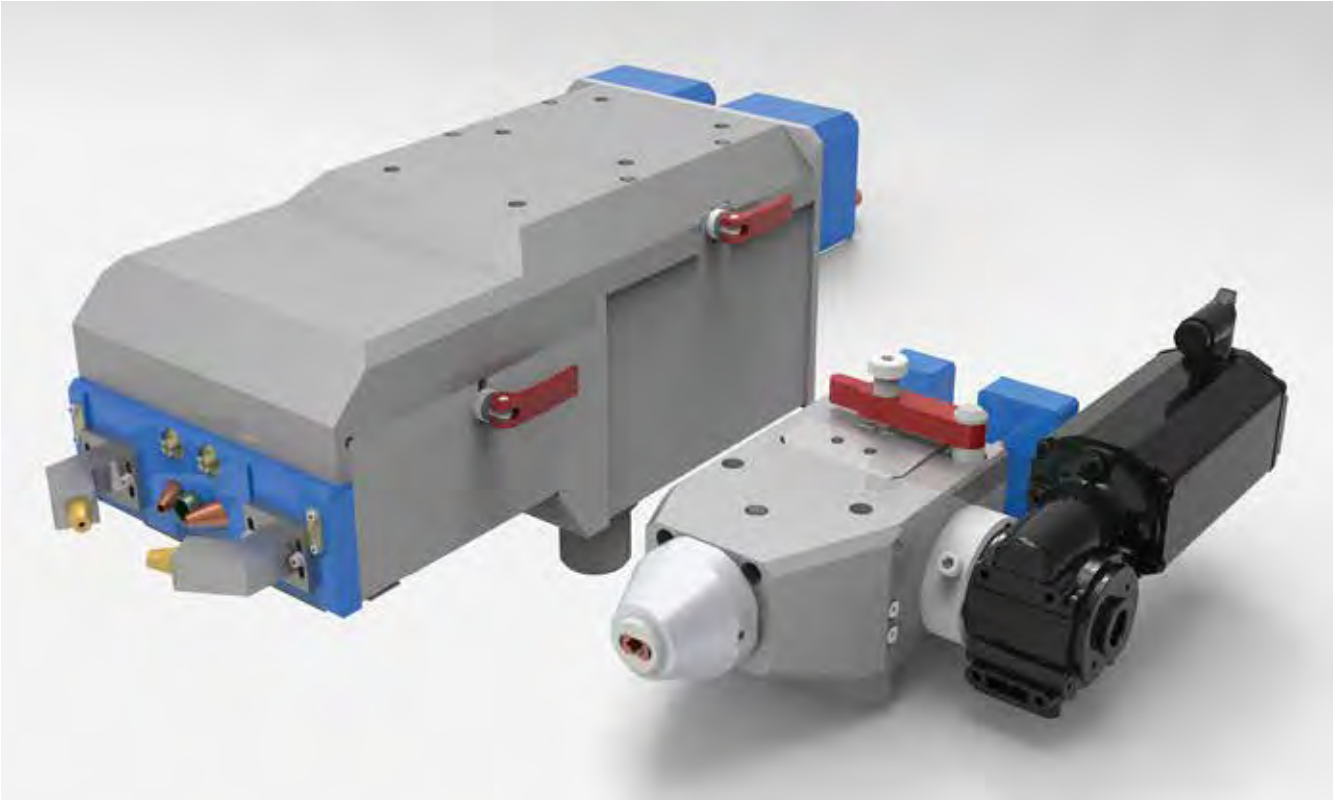
Dr. Thomas Maßmann, Excecutive Vice President
Long Products SMS group

solutions meeting the requirements of each specific use – from the development of new coating layers to the provision of services.

Coating is a good keyword: Thermal coatings are increasingly coming into focus when it comes to corrosion protection, durability and resistance of tubes and pipes. What can visitors learn about coating at the trade show booth?
We will be exhibiting our latest PERFECT jet spraying gun models at the Tube & wire, as for instance the PERFECT jet 2000. This type is particularly suited for the coating of large structures, such as wind turbines installed in offshore parks, whereas he PERFECT jet 401 model is perfect for weld seam coating of ERW (Electric Resistance Welding) profiles. Both applications will be demonstrated to our visitors at the show.

What is your focus in terms of digitalization at this year's booth?
We pay close attention to what drives our customers, and this year we are placing particular emphasis on the product quality of high-grade tubes as well as on efficient maintenance management. We will present our quality-related digital products, such as the Quality Execution System (QES). By means of exhibits, visitors can experience the functionalities and the easy installation and handling of the software. Those who want to get even closer to digitalization are invited to join the "Digitalization Tour" in our EA test field on site in Mönchengladbach and gain practical insights.

Since seamless tube mills are considerably more expensive and require higher capital investment, energy efficiency and faster ROI are essential for long-term sustainability. To this end, what are the specific advantages of SMS seamless tube mills as compared to other technologies available on the market?
SMS PQF® (Premium Quality Finishing) plants allow for the combination of maximum efficiency, optimized operational costs and reduced downtimes without compromising productivity and high quality results; while conventional seamless tube lines cannot viably compete with the high-precision PQF® quality nor with its



SMS group will present its latest developments, as for example PERFECT jet, at the Tube & wire.

The SMS booth offers manifold opportunities for personal exchange.

INTERNATIONAL TRADE FAIRS

wire Düsseldorf
Tube Düsseldorf

5 days!

90,000 m²
fairground

Systematic networking of knowledge and data

ecoMetal trail:
guided tours to exhibitors focusing on sustainability, eco-friendliness, energy efficiency and innovation.

SMS GROUP BOOTH

410 m² booth area

Multimedia

60+ seats

- Focus topic: #turningmetalsgreen
- Interview series Leading Partner Talks
- Live stream on Friday
- Digital quality execution • ThreadView
- X-Pact® Quicksetting • Exhibits • Additive design
- Burners for the use of hydrogen
- Spray heads for new coatings

productivity. And the innovative solution of the fast inlet side improves efficiency even further. With an inline insertion of the mandrel into the pierced billet combined with the highly efficient configuration of the retaining system, cycle times are reduced by four to five seconds. This improves cycle time by about 30 percent.

Rising raw material prices are putting more and more pressure on the wire rod market. What are the specific solutions SMS can offer to the wire rod mill segment?
SMS is striving to reduce or even eliminate the use of reheating furnaces by advancing the process of billet hot charging. In this way, we can combine gas-free production of green steel without gas with low CO_2 and NO_x emissions.

How does the wire rod line of the future look like?
We increasingly recommend our customers to use the new high-efficiency wire rod lines. Specifically, we target processes and equipment with reduced water and electricity consumption – starting from rolling stands to controlled cooling lines with high-efficiency elements designed to reduce water consumption by more than 50 percent. Technical solutions using MEERdrive® technology reduce specific consumption of both products and rolling rings (especially the latter by 60 percent). We will use 360° digitalization with the aid of software such as CCT® 4.0 to further customize and optimize the production processes of quality and special steels, by reducing the energy consumption needed to produce them. These topics will also be at the forefront in the following years up to 2025.

Regarding the need for copper wire for future technologies like e-mobility, renewable energies, digitalization, to what extent is the established CONTIROD® technology still an issue?
In fact, CONTIROD® with its unique selling point, the Hazelett two-belt caster, is a success story, and we can definitely look back on half a century full of vast experience. Since it has been developed in 1972 by Belgium-based Union Minière, U.S. company Hazelett and German steel company Krupp, it has constantly been adapted to ever increasing demands on the final product. This consolidated its great success. Currently, the CONTIROD® process witnesses an advancement thanks to specially developed digitalization solutions. These may serve as a key enabler for targeted process monitoring and preventive maintenance facilitating global networking and remote service over large distances. This shows that the future of CONTIROD® is built on a solid basis consisting of 50 years of comprehensive experience on one hand and the ability to adapt to technological innovations like e-mobility, 3D-printing or the renewable energies sector on the other. ◆

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Further information
www.sms-group.com/press-media/events/tube-wire-2022

PREMIUM FINISHING

CONNECTIONS FOR FUTURE ENERGY SUPPLY AND SECURE CO_2 TRANSPORT

Although the share of renewables in our energy mix has been continuously growing, forecasts say that fossil energies will play a significant role in worldwide energy supply for many decades to come. At the same time, the effort associated with the extraction of fossil energy carriers has become increasingly complex and new requirements, as Carbon Capture and Storage (CCS), for example, present pipe manufacturers with entirely new challenges. All this requires a new, holistic approach. Solutions focusing on the equipment alone are no longer suitable and sufficient to achieve and maintain a strong position in the highly competitive market for premium thread-cutting technology.

"We expect a growing demand for high-grade oil country tubular goods (OCTG), as additional oil and gas production capacities will be needed. In particular in these applications, the quality of pipes and their threads is vitally important," says Benjamin Henkel, Product Manager Technical Sales Cold Finishing, SMS group. The greater the depth at which exploration activities are performed, the higher the quality and performance requirements on the equipment become. Especially, high-pressure, high-temperature and vertical drilling activity has significantly gained in importance. Here, in particular the pipe connections are exposed to extreme stresses.

CCS applications require similar product and quality features. Premium connections with lip seals provide for safe transport of the carbon dioxide. At the same time, the pipes have to be able to withstand extremely low temperatures (down to minus 80 degrees Celsius) and corrosive attack.

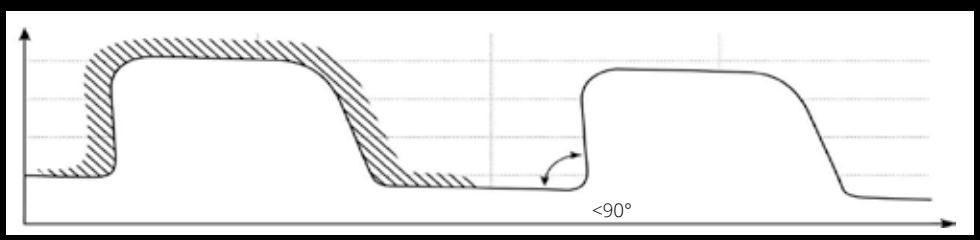
Every premium thread requires a premium heat-treated pipe

There is no premium threaded pipe without a premium heat treatment. Therefore, heat treatment lines play a crucial part in the technology chain for premium thread-cut pipes. During heat treatment, the pipes receive the metallurgical and mechanical properties that make them premium products. The first process unit of our heat-treatment lines is the hardening furnace. We supply hardening furnaces with combustion, induction or with hybrid (combustion and induction) heating systems. Subsequent process stages are quenching and tempering, the straightening machine and the cooling bed. High-precision control of the process temperatures ensures that the finished product possesses the desired metallurgical and mechanical properties.

"For the downstream processing of the pipes and for their oilfield use, it is essential that they feature uniform mechanical properties over their complete length and cross-section. In order to achieve this, it has to be ensured that the temperatures within the entire product are perfectly homogeneous – at all stages of the production process," explains Simone Zussino, Head of Reheating Furnaces & Heat Treatment Plants, SMS group. "Customers using our hardening furnaces and Q&T facili-

WHAT ARE THE CHARACTERISTICS OF A PREMIUM THREAD?

Premium threads are a category of high-performance threads frequently used in advanced oil and gas drilling. These threads are available in a number of configurations and designs that provide superior hydraulic connections and gas tightness, higher resistance to tensile stresses, and they are easier to finish. In contrast to conventional threads, the sealing areas in premium threaded connections are independent of the thread profile and located in two or three areas within the tool connection. This creates some degree of redundancy. Typically, premium threads come with undercuts (angle <90°) and seal seats.



TCG THREAD-CUTTING MACHINES

The TCG-series thread-cutting machines operate on the principle of a rotating tube and stationary tools. Threads produced with these machines comply with premium thread standards ISO 13679:2019/2011 and API 5C5 and achieve best results for API 5B and GOST R 53366 (formerly GOST 631/632/633).

RMG THREAD-CUTTING MACHINES FOR PREMIUM COUPLINGS

Like the TCG-series, the RMG machines also operate on the principle of stationary tools. The couplings are clamped horizontally and do not have to be reclamped during the entire machining process. This reliably prevents the occurrence of misaligned thread axes.

ties can rely on achieving excellent temperature tolerances."

Our current combustion-based furnaces can use natural gas or green hydrogen as fuel. This provides our customers even more flexibility and potential to reduce their carbon footprint.

Thread-cutting machine for OCTG

Following the heat treatment, the pipe ends are threaded. This might sound like an easy task. But is it really that simple? Those considering the investment in a thread-cutting machine for OCTG will find that there is a wide range of different machines to choose from. SMS group's OCTG thread-cutting system has become established and known on the market as the TCG series. Designed specifically for operation under the harsh conditions prevailing in pipe mills, our TCG machines produce threaded oilfield pipes with unparalleled precision. "This excellent performance is possible, last but not least, due to the TCG's high-rigidity and low-vibration design, a competitive edge that pays particularly in the production of premium threads," explains Tim Küppers, Head of Design Cold Finishing, SMS group.

Closing the gap in the portfolio with the RMG thread-cutting machines for couplings

With its latest generation of RMG-series thread-cutting machines for premium couplings, SMS group has rounded out its portfolio as a full-line systems supplier. Plant operators can now also add a premium solution for couplings to their finishing equipment. The design of the RMG-series is based on the field-proven TCG-series concept for premium threads.

The thread measuring system of the future

With both machine series, operators can manufacture high-grade threaded products that are in compliance with international standards, such as API or GOST. These standards require the performance of regular checks to ensure the quality of the threads produced. Such checks used to be performed manually by the operator in a time-consuming effort. That's why we have expanded our portfolio with a fully integrated thread measurement system. ThreadView is an automated system for the optical inline measurement of threads and seal seats in OCTG production – including data evaluation and documentation. It is the first system to offer the possibility of automatically measuring the negative flanks of premium threads. What does this mean in concrete terms?

ThreadView is not only designed for integration into new machines. It can also be retrofitted to existing thread-cutting lines – last but not least, thanks to its minimum space requirements. The measurement head boasts numerous smart technological features which help pipe producers:

- continuously enhance the quality of their products because they can ensure 100-percent inline inspection of all pipes produced without any impact on the cycle times.

THREADVIEW
is an automated system for optical inline measurement of threads and seal seats in OCTG production.

- increase their production yield thanks to ThreadView's capacity to identify - at a very early stage - any issues occurring during the thread production process.
- automate their data evaluation and documentation processes.
- increase their profit as a result of reduced production costs and fewer complaints due to defective threads.

Additionally, ThreadView plays a key role in the realization of digital twins of the threads produced.

Digital twins in thread production

This is where SMS group's QES Quality Execution System comes in. This system monitors, documents and ensures product and process quality along the pipe's entire production chain. The core of the system is its rule-based decision-making software, which processes all information in real time, enabling proactive process control and the automated release of products. At the same time, a certification module checks, at all process stages, compliance with the customers' specifications.

The combination of ThreadView and QES provides us the unique possibility to generate a full-blown digital twin of each thread and its genealogy. Virtually all aspects related to a pipe's quality can be taken into consideration and analyzed. This is the kind of quality management the OCTG industry is looking for.

New service models enable more added value

It is an inherent part of our philosophy to always be close to our worldwide customers as a lifecycle partner for competent, value-adding support. We have enhanced our service offer with a range of innovative concepts. "In addition to conventional one-off contracts, we also offer models such as Equipment as a Service (EaaS). For our customers, this means they don't have to pay for the equipment, but only for its performance. In case of a ThreadView system, only for the measurements performed. Under such a contract, SMS provides the technology and takes care that it is always ready to perform. Our customers can thus benefit from latest technology without having to tie up capital for it," says Jochen Schmitz, Head of Product Management Long Products, SMS group.

Pipe producers can also use SMS group's suite of digitalization products under a performance-based Software as a Service (SaaS) agreement, sparing investment capital.

Everything you need for premium finishing available from a single source

Premium finishing is the solution of choice for the production of pipe connections that have to perform safely and reliably even under the most challenging gas and oilfield environments and need to possess all the performance features required for the transport of carbon dioxide in CCS applications. ◆

Contact
coldfinishing@sms-group.com

SMS DATAFACTORY

To serve as a common basis for all uses in digitalization and to generate added value from data, plant data has to be available in a well structured form. Here, the SMS DataFactory is extremely useful because it converts raw data, such as relational data, process data, time codes and data files, into highly valuable digital information.

SMS DataFactory is able to provide data users a full material genealogy which allows them to combine data of a length-based product with any other length-based product for data mapping. In combination with the QES quality management system, it is possible to summarize the genealogy of a product along its entire production chain and create a reliable basis for comprehensive quality certification.

"Digital solutions are shaping the next industrial revolution"

INTERVIEW

As a leading systems supplier for the metals processing industry, we support an entire industry in its transformation to green steel. Predictive digital solutions in combination with metallurgical expertise build the right tools to help achieve ambitious climate targets. At SMS digital, Wolfgang Scheffel is responsible for Predictive Asset Optimization and Comprehensive Service Products and was part of the development of the condition monitoring system Genius CM®. We talked with Wolfgang Scheffel about the power of digital innovation in the metalworking world and the way SMS can help plants boost performance.

WOLFGANG SCHEFFEL

is responsible at SMS digital Predictive Asset Optimization and Comprehensive Service Products.

What challenges does the metals industry currently face?
Wolfgang Scheffel: Several factors have a big impact on the industry right now. They range from process requirements such as the optimization of operational costs to market challenges like increasing prices for energy or supply chains that have been affected by the pandemic. Sustainability and the necessary reduction of the carbon footprint also play a major role.

What about digitalization in this context?
I see digitalization definitely as a chance! As a matter of fact, digitalization comes with its own set of obstacles, but the benefits far outweigh the difficulties. Digitalization offers immense opportunities to streamline processes even in traditional and hands-on industries such as the metalworking world. That is why SMS group bundles its unique capabilities regarding hardware, electrics, automation, digitalization and technical services. By doing so, we build tailormade and fully digitalized solutions for our customers. Talking about digitalization possibilities.

What does SMS group offer here in concrete terms?
Our area of expertise covers asset optimization, product quality, production planning, and energy management, an entire digital toolbox if you will. Any new plant SMS group provides as of this year will be digital-ready, meaning that data and meta-data are described and utilized in a harmonized way, so that additional digitalization solutions can easily be implemented even in a later stage. With the SMS DataFactory we make sure that all automation and digitalization solutions communicate seamlessly.

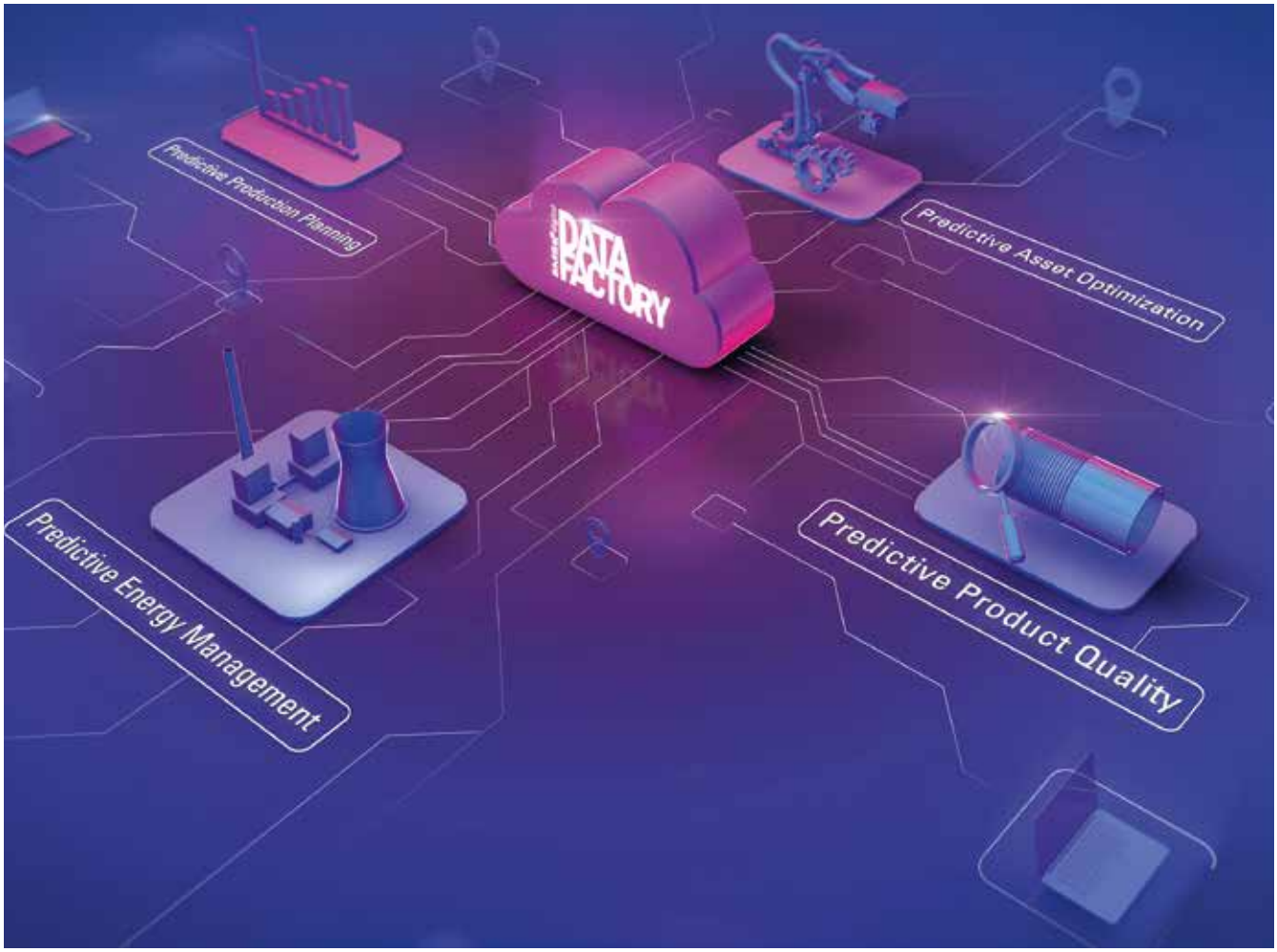
What are the benefits of investing in the digitalization of a plant?
That of course depends on the individual use case, but studies show that with digitalization data can be transferred into actual value. In terms of profitability this means that EBITDA (Earnings before Interests, Taxes, Depreciation and Amortization) margin improvements of up to 6 to 8 percent can potentially be achieved. But, generally speaking, with the SMS group Services we strive to maintain and extend our customers plant performance with regard to (plant) availability, (product) quality, yield, cost and risk, sustainability and safety.

But investments always involve risks. How does SMS group deal with this?
In addition to conventional one-off contracts, which usually end the relationship between the plant builder and the customer after the FAC has been signed, we also offer concepts for building long-term partnerships in the form of performance-based subscription models. Depending on the solution requested by the customer and the agreed value proposition, different models, such as Software-as-a-Service (SaaS), Maintenance-as-a-Service (also known as Technical Outsourcing Services), Component-as-a-Service and Equipment-as-a-Service (EaaS), can be used. These „X as a Service" models offer the customer the possibility to concentrate on his core processes and to secure the positive profit contribution of the SMS solution during the entire contract period.

So, what would be the first step towards digitalized plant operation?
It all starts with the collection of data by utilizing the SMS DataFactory. At this central data hub, all automation and sensor data are brought together in a raw data pool. The next

CUSTOMIZED SOLUTIONS

With a combined total of over 5.000 employees and more than 60 locations, we are always close to our customers. By merging domain and automation expertise with digitalization know-how and comprehensive service concepts as well as performance-based business models, we develop customized solutions that leverage plant performance over the entire plant lifecycle.



All relevant production and process data from the automation systems are pooled in the SMS DataFactory. This makes the SMS DataFactory the central data hub for our software suites for predictive process and condition management, product quality, production planning and energy management.

step is classifying and describing the data with metadata, so data about the data. By bringing together all data from all production entities in the SMS DataFactory, where they are enriched with meta information, we can depict the products' genealogy along the entire production chain. The enriched data is the basis for our comprehensive software suites and the utilization of artificial intelligence and machine learning applications.

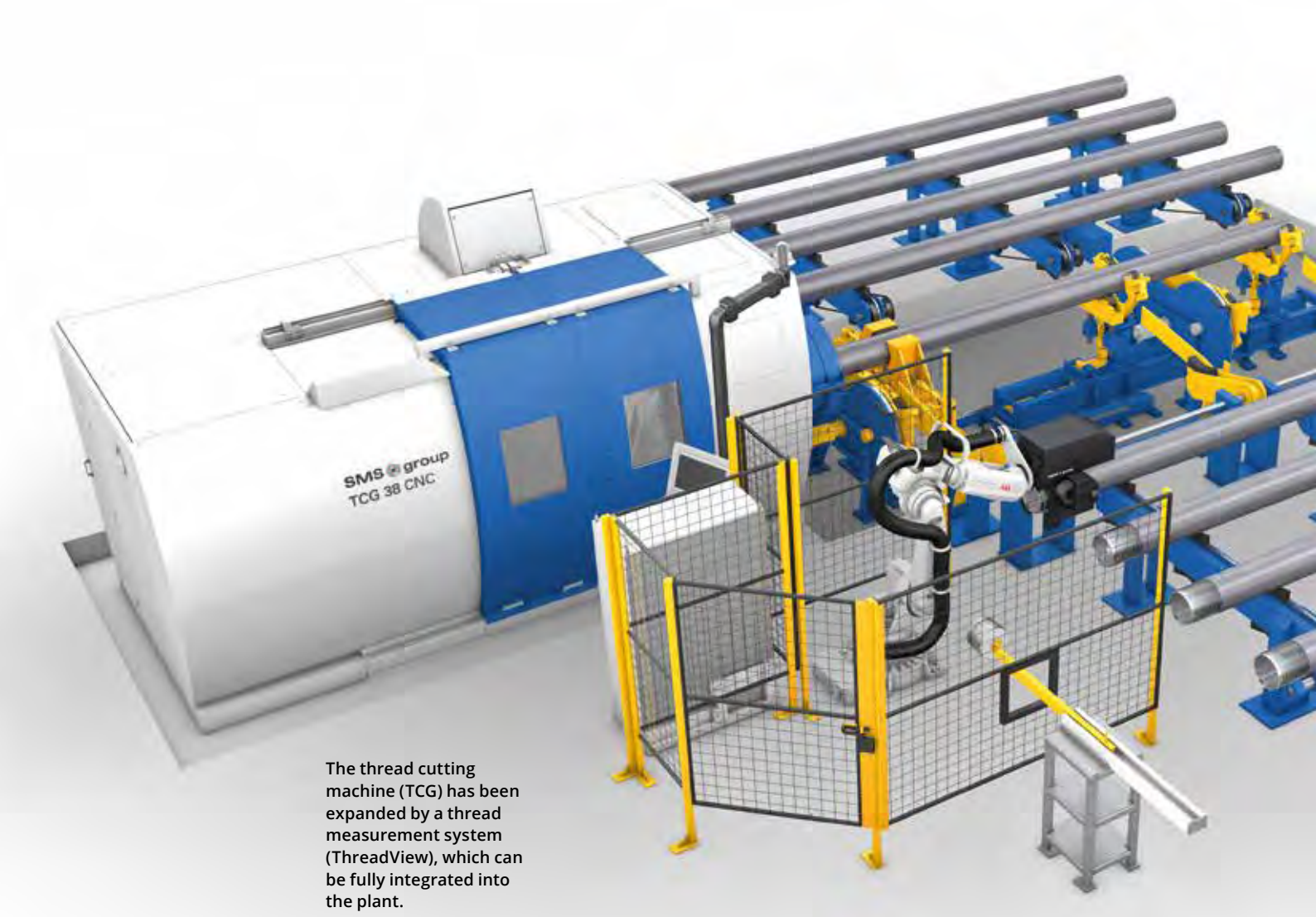
And what would be the physical starting point in the plant?

Basically, the best point to start is wherever the customer sees his biggest pain point, because our solutions allow us to start at any stage – even at the very beginning of the process chain. With the Scrap Management Suite, for instance, we have developed a dedicated solution to analyze the type of scrap available and how it can be utilized most effectively. It enables the melting of exactly the right scrap to achieve optimum results in a smooth and cost-effective process. In general, the journey of digitalization starts with the plant and the processes. Having both under control means to know the current and future plant condition. The advantages of this are obvious: avoiding unplanned downtimes, maintaining stable production conditions and proactively executing maintenance measures accordingly. Here, one of our most powerful tools is the Genius CM® Condition Monitoring. It is a modular online screening system for condition monitoring that mainly works as an asset management system connected to embedded sensors. It shows and even predicts the plant status and gives alarms. These alarms can be

depicted and analyzed in a user-friendly way by our Alarm Manager, another useful tool of our Asset Optimization Suite. Further solutions cover the spare parts and maintenance management. That way, we successively build a holistic asset optimization ecosystem, which forms the basis for predictive maintenance. Thanks to artificial intelligence and machine learning, we can create a continuous improvement cycle so the system will know which parameters to adjust at which stage. This is the highest level of predictive maintenance, and our goal is for all of our clients to benefit from it. Bundling these software-based solutions with automation solutions and the corresponding hardware and services gives us the chance to build comprehensive technology packages for any plant, boosting its performance.

So, all of this is the basis for optimized production and product quality.

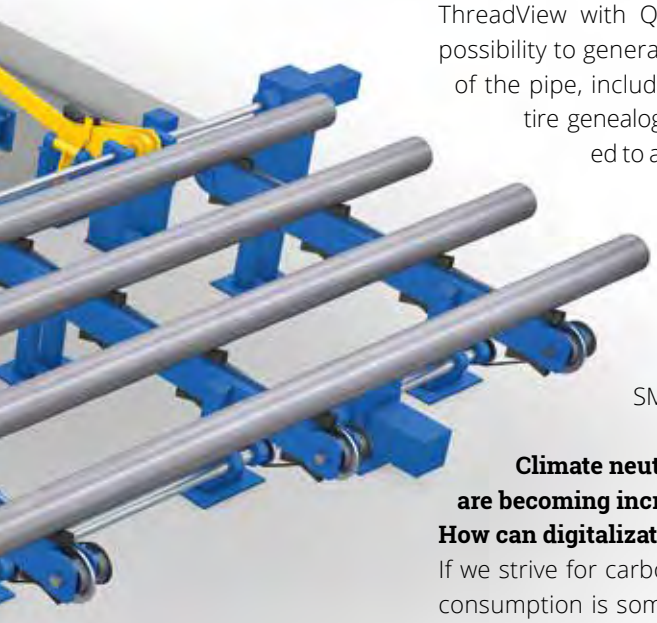
Exactly, and especially when it comes to product quality in long products. The following example illustrates how all these things work together. Pipes are often processed on SMS groups' thread-cutting machines (TCG). Our machines provide high-quality finished products to international and customer standards, such as Premium, API or GOST. These standards also stipulate regular checks to ensure good quality of the cut threads. In the past, only manual checks were possible, making the



The thread cutting machine (TCG) has been expanded by a thread measurement system (ThreadView), which can be fully integrated into the plant.

"Thanks to the use of AI and Machine Learning, we can create a continuous optimization cycle."

examination a time-intensive challenge. This was why we expanded our portfolio by a thread measurement system, which is fully integrated into the thread cutting line. Called ThreadView, this is the first system to offer the possibility to measure the negative flanks of premium threads and is the missing building block for the realization of a complete digital twin of the thread. The system not only enables a 100% measurement of all produced threads; it also ensures an evaluation and documentation of the pipe ends. ThreadView can additionally be combined with our Quality Execution System (QES). QES captures and pools the quality data from various process stages. The software monitors, records, and ensures product and process quality along the whole production chain – from the raw material to the surface-finished final product. Rules are used in all process stages to check the extent to which quality standards are maintained in compliance with the customer's specifications. The system includes a wide range of features for decision-making support, which is very important for the operation of the plant, the process chain and the delivery of the finished products. By combining ThreadView with QES, we have the unique possibility to generate a full-blown digital twin of the pipe, including its threads and its entire genealogy. Nearly all aspects related to a pipe's quality can be taken into consideration and even be certified. This is a major leap in terms of quality management and a unique capability of SMS group.



Climate neutrality and sustainability are becoming increasingly important. How can digitalization improve energy use?
If we strive for carbon neutrality, then energy consumption is something we have to tackle. That's why energy efficiency plays a vital role, but also its smart use. In any steel plant, most of the energy is consumed in the steelmaking and casting processes. This means that sometimes it could make sense to operate an electric arc furnace only at night when the cost of power is lower. But this, of course, is not a long-term solution. The goal always must be to save as much energy as possible. Here, our Viridis Energy and Sustainability Suite by Vetta comes in. This platform exploits the power of IoT (Internet of Things), Big Data, Machine Learning, and other Industry 4.0 technologies to significantly reduce energy and resource consumption while improving efficiency, planning, and management.

Does this mean that you are paving the way for a fully automated production?
It's not at all about replacing humans, it's about smart interaction between humans and machines – the next level of process engineering. Qualified staff is still the biggest asset in any plant. Production optimization involves not only machines but also the people who work with them. Digitalization guarantees that time-consuming manual processes are eliminated and that workflows become more secure. This is something everyone benefits from. ◆

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Further information
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Projects around the world

Join us on a tour of impressive projects in tube and pipe as well as bar and wire manufacturing around the world. In the past few years, SMS group has been able to book numerous new orders and successfully implement major projects. We present some of them here.

EUROPE

MANNESMANN STAINLESS TUBES (MST)

Together with our long-standing customer and partner Mannesmann Stainless Tubes (MST), a company of Salzgitter AG, we were able to set another milestone in the history of successful seamless tube production: The **world's largest cold pilger mill** from SMS group went into operation, expanding MST's production portfolio for seamless stainless steel tubes at its site in Remscheid, Germany. With the new plant MST's expanded product portfolio now includes larger pipes with **outside diameters of up to 290 millimeters**. ◆

AMERICAS

ATLAS TUBE/ZEKELMAN

Zekelman Industries selected SMS group in 2019 as partner and main supplier of a complete new **28-inch ERW tube welding line** for its "Atlas Tube" structural tube division. Currently, Atlas Tube produces the world's largest tube dimensions on this brand new continuous ERW Jumbo tube welding machine by SMS group in North America. The 22 x 22-inch hollow section comes with a **wall thickness of 1 inch (25.4 millimeters)** and supports Zekelman Industries to meet the demand for domestically produced in the bridge, transportation and building markets. ◆

AMERICAS

AMERICAN SPIRALWELD PIPE

Back in 2019, AMERICAN SpiralWeld Pipe Company LLC. awarded SMS group an order covering the supply of a new **online spiral pipe mill** for a new greenfield plant ("Plant 3") at Paris, Texas, USA. Today, our PERFECT arc® technology enables energy savings of up to 30 percent compared to competitor plants. The mill operates in the so-called one-step ("online") process with submerged-arc welding from the inside and outside taking place directly after spiral pipe forming, producing pipes of more than 55 feet (16 meters) length with an outside diameter ranging from 24 to 144 inches (610 to 3,658 millimeters) and a maximum wall thickness of 1 inch (25.4 millimeters). ◆

IMEA

PROMETAL ACIERIE

In 2018, Prometal Aciérie, Cameroon, Africa, awarded SMS group the order to supply a **new hot rolling mill for rebars, sections and wire ro**d. The new rolling mill is designed for the production of straight rebars, angles, channels, flats, squares, beams and wire rod coils, enabling Prometal to expand its product portfolio, covering as large a part as possible of the product mix for long steel products. With this investment, Prometal installed the **first combined rolling mill in the African region**. ◆

IMEA

FERALPI GROUP

The Lonato-based **rolling mills** of Feralpi Group will be modernized with SMS group technologies. The upgrade aims to enable the gradual conversion of production from five-ton to **eight-ton coils** in order to meet any need in worldwide markets. Moreover, the measures will lead to a reduction in **gas consumption and emissions**, as the existing reheating furnaces will be dismantled and replaced by induction furnaces of SMS ELOTHERM and a latest generation EBROS® billet welding machine. Also, part of the modernization is the installation of a **VCC®** line (Vertical Compact Coiler) including a six-pass **MEERdrive finishing block**. ◆

CHINA

JIANGSU CHANGBAO PRECISION STEEL TUBE

To enhance productivity without compromising quality – while incorporating the latest environmental-friendly technologies – Jiangsu ChangBao Precision Steel Tube Co., Ltd. in China has invested in a seamless tube plant featuring the PQF® process. **This PQF® mill is the world's most advanced** PQF Bilateral Change-Over mill designed and manufactured by SMS. With the new PQF®, ChangBao produces tubes with **diameters of up to 180 millimeters** and **wall thicknesses between four and 20 millimeters** while meeting closest tolerances. ◆

CHINA

YUXI YUKUN IRON & STEEL

We are pleased to welcome another customer to the HSD® (High-Speed Delivery) family: Yuxi Yukun Iron & Steel decided to equip their rolling mills with **seven HSD® systems** at one. Compared to traditional mills using slitting systems, the HSD® High Speed Delivery system increases the product yield due to tight tolerances on each strand. ◆

INDIA

MUKAND SUMI SPECIAL STEEL LTD.

After remote commissioning in June 2021, the new **rolling mill** established at Mukand Sumi Special Steel Ltd., a joint venture of Mukand Ltd., India, and Sumitomo Corporation, Japan, is able to process **400 different steel grades**. Aimed at great flexibility in production, Mukand's mill was designed to produce straight round and hexagon bars, wire rod and bar-in-coils. With an annual output of 400,000 tons in the first stage, the facility is prepared for a future capacity increase to 600,000 tons per year. The new mill has brought Mukand and Sumitomo Corporation a big step closer to their goal of serving the domestic market and exporting specialty steels all over the world. ◆

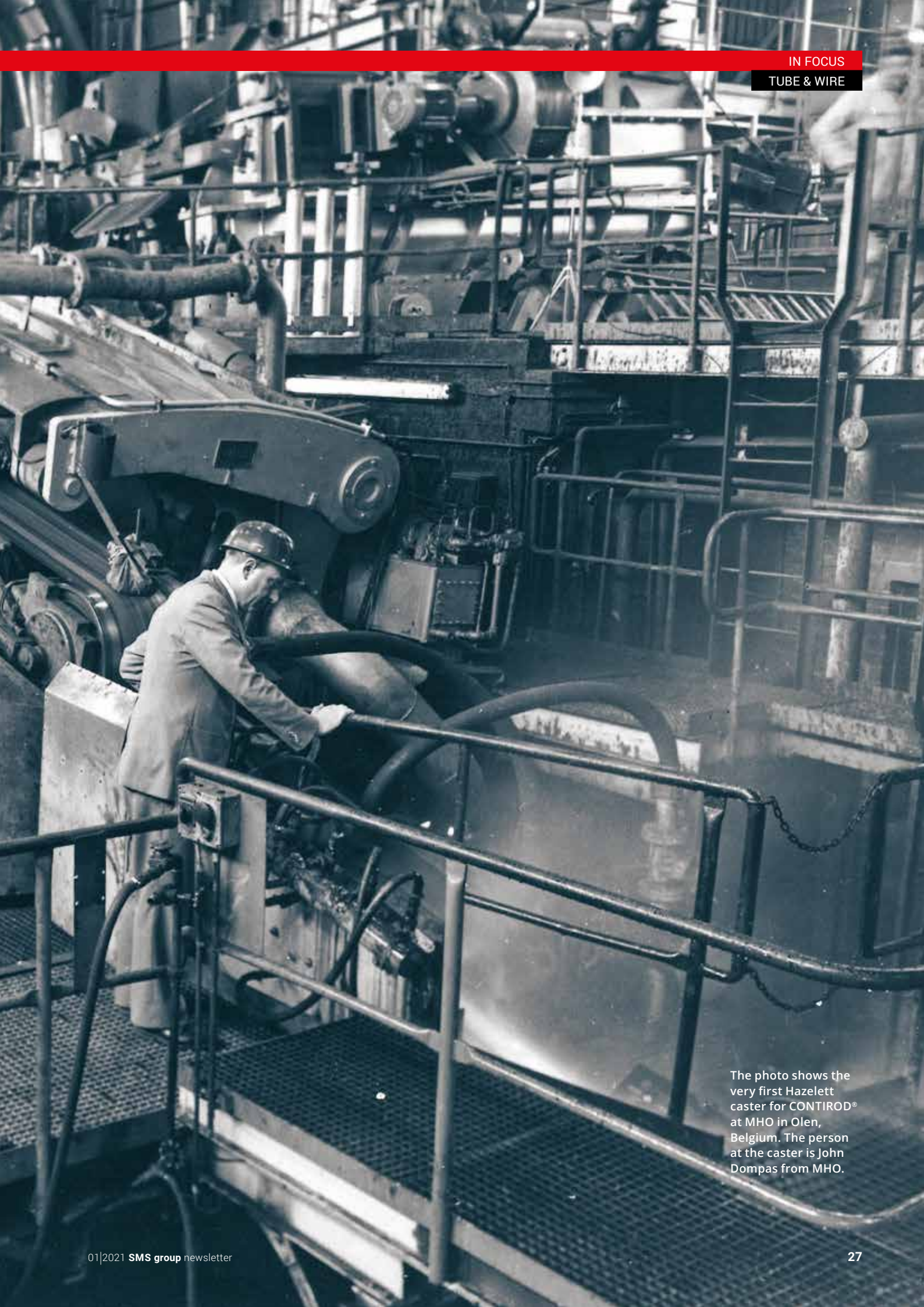
IMEA

PADANA TUBI

Padana Tubi's construction site in northern Italy is filling up: The impressive hall will soon be home to the new **18-inch SMS ERW tube welding line** as well as a dedicated slitting line. With the new line Padana Tubi increases the product portfolio for round tubes up to 406 millimeters diameter, as well as for square sections up to 350 x 350 millimeters and rectangular sections up to 500 x 200 millimeters.
Besides **heavy wall thicknesses of up to 18 millimeters**, the mill is specially designed to produce high grades up to 700 N/mm². The products are mainly intended to satisfy the demand in the construction and the building sector. As single-source supplier of the complete mill equipment we are very proud to support Padana Tubi with this new investment in strengthening its position as a leader in the market for welded tubes and pipes, with more than 1,000,000 tons of steel tubes produced and sold every year. ◆

50 years of CONTIROD® technology

SMS group draws from many years of experience in the continuous copper wire casting and rolling process.



The photo shows the very first Hazelett caster for CONTIROD® at MHO in Olen, Belgium. The person at the caster is John Dompas from MHO.

You can't do without it: Copper wire is used in the growth markets of renewable energies as well as electromobility. It is used in transformers and cables, for example, but also in the motors of electric vehicles. CONTIROD® plants can produce up to 400,000 tons per year of high-quality copper wire rod. A fully integrated casting and rolling process turns copper cathodes and clean copper scrap into a perfect starting material for conductors.

SMS group draws from 50 years of experience in copper wire rod technology. Its expertise banks on a new process for the continuous production of copper wire rod developed in 1972 by Union Minière, Belgium, Hazelett based in the United States and Krupp in Germany.

Constant further development

Copper producer Union Minière took the lead in process technology. An ASARCO shaft furnace served for melting the copper cathodes. For the very first time, a Hazelett twin-belt caster was used to continuously produce a cast ingot from liquid copper, and right from the start, a Krupp rolling mill shaped the cast ingot to copper wire rod in an inline rolling process. The equipment needed to treat the rolled wire rod surface was purchased from subcontractors. Coiler and coil handling equipment were made by plant manufacturer Krupp, too. After they had gained first experience in production, Krupp placed the newly developed CONTIROD® system on the market worldwide. Up to now, company names have changed several times from Krupp to Mannesmann Demag Sack and finally to SMS group.

The tradition of CONTIROD® has been continued and can look back on a remarkable success story to this day. Constant advancement and adaptation to ever increasing demands on the final product have always been the driving force behind innovations. Hence, the development of separate drives for the individual mill stands marked a milestone in measuring and control technology. Aided by modern drive systems with frequency-controlled motors it was possible to significantly reduce electrical energy consumption. Advancement of the shaft melting furnace by optimizing the furnace vessel shape, using an innovative cathode charging method and a complex individual burner control system led to a sustainable improvement in process stability.

Currently, the CONTIROD® process is climbing the next rung on the evolutionary ladder thanks to specifically developed digitalization solutions. Digitalization enables targeted process monitoring and preventive maintenance. Thus, networking with customers worldwide has become much easier, and remote service overcomes large distances.

The CONTIROD® success story with its unique selling point, the Hazelett twin-belt caster, is being continued even 50 years after its creation. Vast experience gained over a period of half a century as well as current developments such as 3D printing, digitalization and global remote support are the pillars on the basis of which CONTIROD® is being carried into the future. ◆

* CONTIROD® is a registered trademark of Aurubis Belgium

Thomas Schatz
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OPTIMUM QUALITY

Thanks to the Hazelett twin-belt caster, the copper ingot features a fine-grained and homogeneous casting structure with uniform distribution of oxygen and impurities – one of the most important facts for optimum product quality.

CONTINUOUS ADVANCEMENT

Thanks to constant advancement and adaptation to ever increasing demands, CONTIROD® plants can produce up to 400,000 tons per year of high-quality copper wire rod.


Quicksetting
Recipes
Settings
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Quicksetting
Process Overview
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100,6
Roll set
13
Variant
1
Last modified
9.8.2019
13:46:22
Last download
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Last upload
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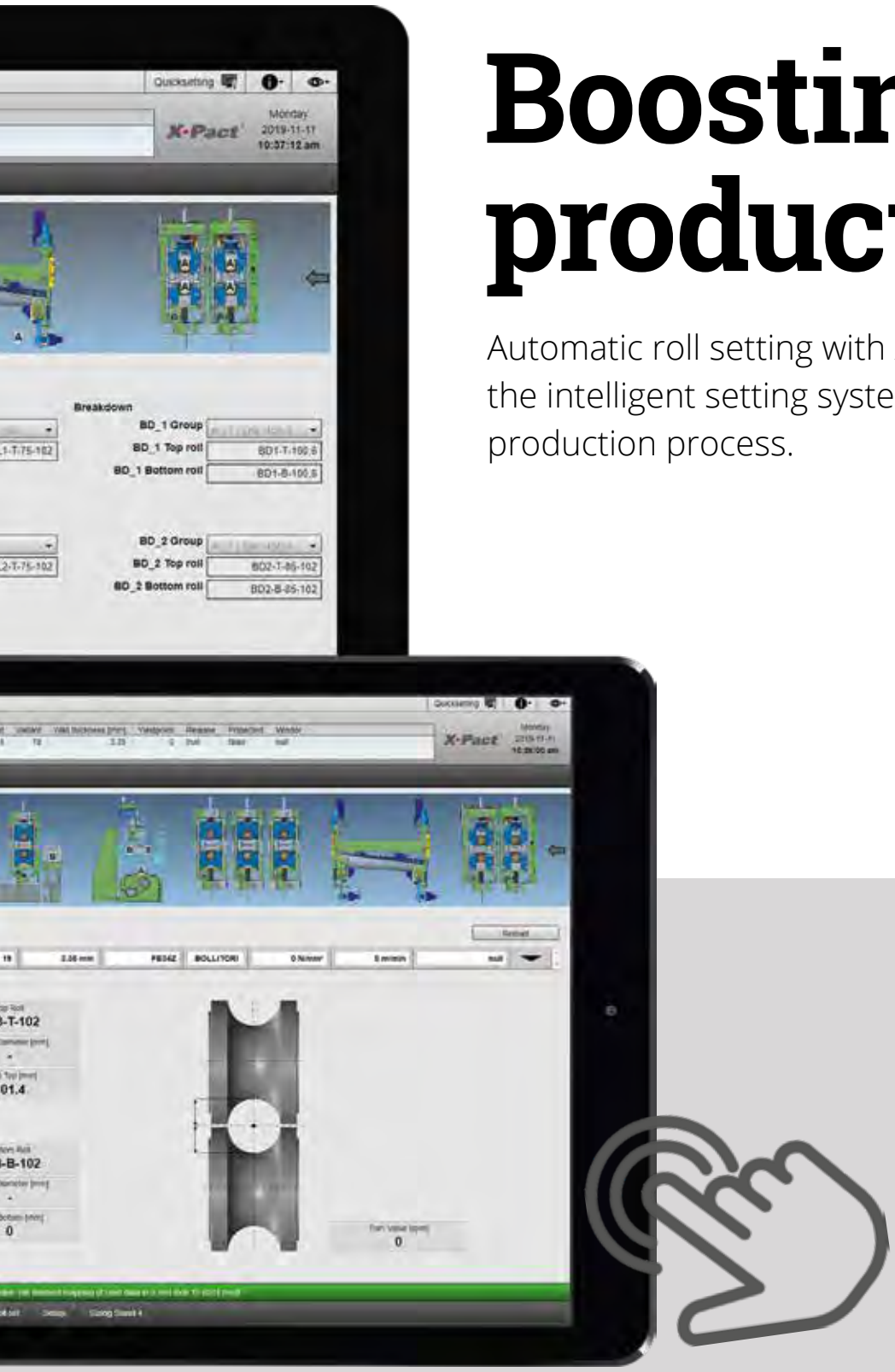
15:57:41
Roll group selection
Used Setup
Sizing
De-Twisting Group
De-Twisting Height roll Op
De-Twisting Height roll Dr
SZ_1 Group
SZ_1 Top roll
SZ_1 Bottom roll
SZ_2 Group
SZ_2 Op roll
SZ_2 Dr roll
SZ_3 Group
SZ_3 Top roll
SZ_3 Bottom roll
SZ_4 Group
SZ_4 Top roll
SZ_4 Bottom roll
Squeeze
Top Group Op
Top roll Op
Top Group Dr
Top roll Dr
Side Group
Side roll Op
Side roll Dr
Fin Pass
FP_1 Group Top
FP_1 Top roll Op
FP_1 Top roll Dr
FP_1 Group Bottom
FP_1 Bottom roll Op
FP_1 Bottom roll Dr
FP_2 Group Top
FP_2 Top roll Op
FP_2 Top roll Dr
FP_2 Group Bottom
Linear Forming
Inlet Group
Inlet roll
Outlet Group
Outlet roll
Recipes
Retrieve from line
Tools
Setup



Boosting productivity

Automatic roll setting with X-Pact® Quicksetting, the intelligent setting system for a highly flexible production process.

Growing flexibility in production, ever-smaller batch sizes and increasingly expanding product ranges are key requirements nowadays applying to production processes in the steel industry. Alongside these factors, continuous advancement of automation technology is an essential prerequisite for staying competitive and supporting the production staff with the latest automation solutions.

The Quicksetting module, which had been successfully in use for many years in ERW welded tube plants, was re-implemented in 2019. The new version was updated with current software technology and provided with a new, web-based user interface. At the same time, the Quicksetting module was integrated into the X-Pact® brand family.

Combining the automation system with an intelligent database software establishes the link between plant engineering, technological know-how and operation. The X-Pact® Quicksetting system provides intelligent connectivity and systematic networking of knowledge and data, thus setting a new standard in plant automation.

SMS group has developed an innovative integrated solution for shortest possible change-over times in ERW welded tube plants. The centerpiece of this solution is the X-Pact® Quicksetting system. It reduces change-over and setting times in welded tube plants and thus increases productivity. Thanks to database-supported plant settings, product quality can be reproduced and continuously improved. The system meets all current requirements for high flexibility in production with ever-smaller batch sizes and wider range of products.

X-Pact® Quicksetting saves all parameters and roll data of the product portfolio in a database. The data record can then be gradually supplemented to include the plant owner's customized settings.

As part of X-Pact® Process Guidance, X-Pact® Quicksetting allows the customer to take full advantage of his plant in an easy way: using the intuitive interface of the intelligent, database-supported software, the operator can set the desired tube format and transfer it to the plant – the corresponding settings are executed automatically. All settings can be easily saved to achieve reproducible results. In this way it is ensured, tubes with the same parameters and quality can be reliably repeated later on.

What's more, the system provides a platform solution and hence the possibility of running multiple licenses for tube welding plants on one physical server.

Optimized processes

With the X-Pact® Quicksetting roll management module, the ideal configuration and the required rolls for the subsequent tube format can be planned while production is underway. Everything is ready and in place before the size change. In this way, tube producers can measurably minimize changing times.

State-of-the-art web-based user interface

Accessing the user interface via a web browser is a future-proof solution with maximum flexibility. Based on the specified setting, the database provides the relevant setting data and transfers them to the plant operator panels. The PLC system then positions the rolls automatically. The language of the user interface can be selected and translations be quickly put in.

Latest references

Over the past few years, our customers have seen an increasing need for larger, high-strength steels in the bridge, transportation and building sectors. In the North American market, for example, Zekelman Industries and its Atlas Tube structural steel division have been relying, for several years already, on tube welding technology supplied by SMS group. At the world's largest continuous ERW tube welding line installed in Blytheville, U.S.A., the intelligent X-Pact® Quicksetting system of the new welding line is helping to satisfy the strictest requirements in terms of product quality and throughput. The system will also ensure a modern level of automation and reliable system settings at the new plants for Padana Tubi & Profilati Acciaio in Guastalla, Italy, and for Bull Moose Industries in Chesterfield, U.S.A. As part of a modernization project, SMS group successfully implemented the X-Pact® Quicksetting system at Arvedi Tubi Acciaio in Cremona, Italy. ◆

Markus Fritz
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KEY FEATURES

- Higher productivity due to X-Pact® Quicksetting change system
- Optimized processes, process-oriented, ergonomic and simple operation
- Technologically suitable setting values selectable for each product
- Reproducibility and reliability of system settings
- Systematic cross-linking of knowledge and data
- System extensibility by adding further modules and applications

Ever increasing know-how

Based on SMS group's forming process expertise, the system permits different variants within one product family to be generated. Once the product quality has been approved, the operator uploads the settings to the product database. In this way, data sets for new sizes can be created and optimized on the basis of similar product settings. The longer the plant is in operation, the greater is the inventory of optimized setting data.

Forward thinking and reliable

The system also takes into account roll redressing and automatically corrects the positions and speeds in line with the current roll diameters uploaded into the system.

From an architectural perspective, the five modules of the new Campus will branch off in all directions like teeth in a cogwheel. The rooftops will be greened, and the common center be crowned by a membrane cover of approx. 82 meters in diameter.

SMS group Campus

Investment in the future

On its Mönchengladbach premises, SMS group is building a highly innovative Campus bringing together employees who have worked at several surrounding sites so far. In this way, SMS group will bundle its competencies at two locations: Mönchengladbach will be the center of technology, digitalization and service, Hilchenbach the innovation center for flat products. Covering an area of 50,000 square meters, the Mönchengladbach location will be home to 2,000 specialists, with modern workplaces perfectly tailored to meeting current and future demands. The open character of the Campus will promote interaction as well as agile collaboration and inspiration along the entire value chain. The beginning of 2022 saw the completion of the Campus shell and marked the start of interior work. Grand opening of the new building is scheduled for fall 2023.

Further information
www.sms-group.com

OUR DRIVE, YOUR PERFORMANCE

Megatrends, such as digitalization, ecology and climate protection, play an increasingly important role in the challenging market environment of the metals industry. Against this backdrop, SMS group has pooled all its competences in the disciplines Electrics/Automation, Digitalization and Technical Service to develop integrated solutions that achieve long-term efficiency and performance improvements for our customers' facilities.

The world of metals is becoming increasingly challenging. Global megatrends, such as the digitalization of production and the protection of our climate and environment, have a significant impact on our customers' businesses. In the face of these developments, many of our customer feel the need to optimize the operation of their plants and their process management, with aspects like sustainability and occupational safety playing an increasingly important role in addition to economic efficiency. To be the Leading Partner for our customers in this transformation process, SMS group has pooled all its Electrics/Automation, Digitalization and Technical Service competencies.

Together with our customers, we develop integrated solutions tailored to their specific use cases. Our modularized approach allows us to combine products and services from the three areas EA, Digitalization and Technical Service into performance-based business models. We focus on key performance indicators such as plant availability, product quality, productivity and delivery reliability, but also on sustainability and occupational safety. By combining our integrated products and services with performance-based business models, we become a long-term partner for our customers, providing them the flexibility to focus on their core competences.

With our integrated solutions, we cover the entire lifecycle of a plant:

1. We CREATE your Asset
In new-plant projects, we help speed up the ramp-up curve and improve the overall plant performance. We achieve this by harmonizing our electrics and automation solutions as best as absolutely possible with our digital solutions. The SMS DataFactory, digital twins and our Plug & Work integration test play a pivotal role in this context.

2. We INCREASE your Performance
During operation of a plant, we assure stable production, ensure and enhance plant performance and help our customers with data-based decision-making. By deriving specific recommendations for the operating and maintenance personnel on the basis of current process data, we convert data into information and information into added value.

3. We MANAGE your Lifecycle
Finally, we help our customers extend and optimize their plants' lifecycle. Here, our customers benefit from close service partnerships, our maintenance and repair service in OEM quality, long-term outsourcing partnerships, and consulting and training services.


SMS group
SMS group

"We want to support our customers during the entire lifecycle of their plants, always providing the best possible solutions. As the Leading Partner, we supply everything from a single source. This is what distinguishes us from our competitors."

"Many of our customers want to be able to focus more on their core processes and, therefore, have their maintenance services handled by service partners. These customers will only rely on partners able to provide these services most efficiently and sustainably. Here, SMS group is very well positioned: We design the plants, we commission them, and we have the necessary set-up to accompany them, in combination with digital solutions and service products, during their entire lifecycle."

Prof. Dr.-Ing. Katja Windt,
Member of the Managing Board (CDO), SMS group

As SMS group, we are perfectly positioned to support our customers on the pathway towards more sustainability and profitability. In our integrated solutions, we combine 150 years of experience in metallurgy and plant engineering with profound digitalization expertise. Thanks to our closely tied service network of more than 5,000 employees at more than 60 service locations worldwide, we are always close to our customers. This unique combination makes SMS group the Leading Partner in the World of Metals. The development of our integrated solutions is usually a very customer-specific process. This process may start even before the relevant issues have been identified in detail. We have asked three colleagues from the three CoEs (Centers of Excellence) involved – Electrics/Automation, SMS digital and Technical Service – to explain how each one of the three areas contributes to the implementation of this common vision and what benefits our customers derive from the achieved integrated solutions.

For the integrated solutions, data are needed in the first place. We have asked Klaus Pronold how these data are generated?

Klaus Pronold: It all starts with our plants. The plants SMS group supplies today are all digital-ready. A plant is considered digital-ready, when its machine and automation data are described with contextual meta-information and with data access information which is published in a standardized form via supported interface technologies in a "dictionary".

We supply equipment for the entire metallurgical industry and all its process steps. The plant - with its mechanical equipment, the automation solution including sensors, gauges and actuators, as well as the drives and robotics - forms the basis for our integrated solutions.

As one of the world's largest systems integrators in the metallurgical business, SMS group ensures with its X-PACT® (PROCESS AUTOMATION CONTROL TECHNOLOGY) that all plant components complement each other in a perfect way. Latest automation and digitalization technology opens up a wide field of possibilities for operating entire plant complexes in a highly dynamic and resource-saving way. Human intervention is much less often needed since proven, highly sophisticated automation and digital applications enable intelligent interconnectivity between all plant parts.

“Our domain knowhow and our advanced automation expertise provide the perfect basis for our digital solutions. Our approach is holistic in the truest sense of the word. It includes all aspects from the sensor level up to the latest digitalization developments.”

Klaus Pronold, Vice President CoC Electrics/Automation Flat Rolling Mills, SMS group

PERFORMANCE DIMENSIONS

For our vision of autonomous plant operation to become reality, we have identified dedicated and performance dimensions: (plant) availability/process stability, (product) quality, yield, cost and risk, sustainability and safety. For the individual customer project, these performance dimensions can be underlaid with quantifiable performance indicators. This enables us to precisely identify and measure improvement potentials and the performance of our integrated solutions.

This means, you build integrated data models for the entire process chain and over the entire lifecycle of the plant. Why is that so important?
This forms the basis for a fast and successful digitalization and hence the collaboration between the disciplines Electrics/Automation, Digital and Technical Service. This sets the standard and gives guidelines for all SMS group plants. We apply these standards and guidelines for building and using digital twins, for example. By merging the harmonized real-time production and process data with data and models from the engineering and construction phase, we can build a virtual representation of the

“With our software suites, we cover the entire metallurgical process chain and focus on turning data into information and information into value.”

Fabrice Hansen, Vice President Asset Optimization, SMS digital GmbH

actual plant, which we can then use to monitor and optimize processes, predict events and elaborate actions and operator guidance. A good example of how we apply a digital twin in real life is our X-Pact® Plug & Work integration test, which we use for various tasks, such as for pre-testing and pre-optimizing the entire automation for a plant, for training the customer’s on-site personnel and for ensuring a fast production ramp-up with excellent performance results.

Additionally, integrated and harmonized data models, as our “digital-ready” concept, form the basis for a smooth integration of artificial intelligence and pattern recognition applications – another important step towards autonomous plant operation.

Fabrice Hansen oversees the development and implementation of software, mainly for and

X-PACT® PLUG & WORK

This concept developed by SMS group allows digital commissioning under realistic conditions with 3D simulation views, significantly shortening the commissioning times on site. For each SMS group project – both new plants and modernizations – the new automation system is completely installed, tested and pre-optimized in our test fields worldwide. The training of the customer’s staff takes place in a close-to-real environment. This is possible thanks to a real-time process simulation including all relevant kinematic and dynamic behavior of the plant components and their interactions. As all technological features are considered, the 3D simulation model helps to literally take the plant to the test field for virtual operation.

with specific plants, at SMS digital and at Paul Wurth. We asked him why he thinks that, when it comes to software expertise, customers should work with SMS group rather than with some fancy AI start-up?

Fabrice Hansen: It mainly comes down to merging sophisticated software and AI skills with down-to-earth and fundamental process and machine knowhow. Nowadays, none of the two alone can bring long-term customer benefit. Let's take, for instance, a modern blast furnace that has nearly reached its physically possible maximum efficiency. In this case, process knowhow alone will not be able to do the job. On the other hand, the equipment and the metallurgical process are too complicated to achieve a substantial benefit alone by looking at the data. This is exactly where the unique expertise of SMS group comes into play. As a full-liner in metallurgical plant engineering, we are able to consider all elements of the production chain. With our integrated solutions, we merge this domain knowhow with in-depth software and AI competence and holistic service concepts. This combination makes us unique in the market and provides truly sustainable benefits for our customers.

SMS DATAFACTORY

The SMS DataFactory collects data from the existing plant automation system and makes these data available for other applications. The system consists of various components that jointly enable the comprehensive preparation and analysis of all plant data. The integrated data catalogue provides metadata of the data and signals stored in the SMS DataFactory. The metadata assist with the interpretation of data, give meaning to the data, describe their characteristics, and define rules for using the data in external applications.

The SMS DataFactory is scalable and can be used for a specific plant or machine as well as for a complete plant complex or an entire company. In this way, it is possible to start out from a specific plant section and later extend the application to include other plant components.

What role does digitalization play within this comprehensive concept?

When it comes to digitalization, for us, the overall goal is to derive data-based actionable items in real time, which are fed back into the plant automation systems either manually or automatically in a closed-loop approach. These actionable items are also used to trigger specific maintenance jobs, repair tickets or spare parts. We gather all relevant plant and process data within our SMS DataFactory. Here, the data are enriched and made accessible for our software suites. We offer five different suites focusing on asset optimization, health and safety, product quality, production planning and energy management. All products within each one of the suites can communicate with the others via the SMS DataFactory. By applying rule-based decision-making techniques, pattern recognition and artificial intelligence, our products can convert the data into information that can be translated into actionable items and information for operator guidance.

Could you please give an example of how the various software solutions interconnect?

A very illustrative example of our approach is the monitoring of segments in a continuous caster: During production, our X-Pact® automation solutions continuously provide data on the current casting speed, materials, temperatures, pressures etc. and on the given data set points. These data are transmitted to our Genius CM® condition monitoring solution via the SMS DataFactory. Here, the data are processed and used to run analyses of the electric motor systems or the acoustic emissions, for example, or even to monitor cylinders, drives or nozzles for clogging. By combining both real-time process data and information from the condition monitoring system, our DataXpert® system can provide predictions about the status of nozzles, drives, greasing and cooling lines, and other central components within the caster system. This information can be turned into actionable items and operator guidance, and fed back into the caster automation systems.

Based on the current plant and equipment status, our IMMS® maintenance management system can schedule necessary maintenance tasks and align these with production planning. In this way, unnecessary production stops can be avoided. With the help of our eDoc digitalized plant docu-

mentation system, it is even possible to identify and order required spare and wear parts.

The integrated solutions designed by SMS group are highly customized and include products and services from various disciplines from within SMS group. Zaiying Wang explains how SMS group goes about combining them into integrated solutions?

Zaiying Wang: When a customer does not come to us with a specific inquiry, or when it is not obvious right away what exactly the issues are, we usually conduct an audit or agree a consulting project with the customer. In such projects, we not only assess the as-is-status of a plant, process, supply chain or the like, but we usually also develop an approach on how to solve the identified issues. For this, we closely collaborate with the customer and the teams on site. We combine competences from all CoEs involved and from all of SMS group's regions. Our diversity is the cornerstone of our innovative strength because development is only possible in a place where the most diverse people come together.

"On our way towards autonomous plant operation, we all work together for the same goal, which is to boost the performance of our customers' plants."

Zaiying Wang, Vice President Service Division, SMS group China

AUDIT & CONSULTING PROJECTS

Audit. In an auditing project, we run an as-is status mapping focusing on the evaluation of our customers' challenges. Based on the audit, we can where potential areas for improvement are. Focal points of an audit could be the equipment, production processes, business processes, software, supply chain or technology.

Consulting. In a consulting project, we focus on dealing with specific customer problems and customer requests. Consulting is centered on answering the customer's questions. The consulting can be preceded by an audit to identify the as-is situation or the consulting project can be executed as stand-alone.

How does SMS group support customers in their daily operations?

It is our goal to build and maintain long-lasting partnerships with our customers. That means, we support our customers even after the FAC has been signed. With more than 5,000 employees in our global service team and more than 60 service locations worldwide, we are always close to our customers. An example of this is our Technical Outsourcing Service, a proven and successful concept for our lifecycle partnerships. We offer a broad spectrum of services, including maintenance and operational services, that range from fully integrated to menu-based solutions for individual processes.

We also offer on-line and off-line maintenance & operational services, including all ancillary services such as inventory management, logistics, workshop management and planning. Our service offer is not limited to our proprietary equipment, but delivered and applied based on our in-house reliability engineering applications, policies and controls. We have established a continuous improvement process that we use as a platform to integrate our digital and predictive solutions to ensure that common performance targets are met or even exceeded for both green-field and brown-field processes.

What are benefits of such an integrated approach?

One big advantage for our customers is that they can focus on their core business, which is operating a plant - not maintaining it. With our integrated solutions, as our Technical Outsourcing Service, we re-

lieve our customers of certain risks or problem areas, while agreeing specific performance promises. Depending on the desired solution and the agreed value proposition, we offer different business models ranging from Software-as-a-Service, Maintenance-as-a-Service (as the Technical Outsourcing Services), Component-as-a-Service to Equipment-as-a-Service. We combine products from different areas - mechanics, E/A, digitalization and Technical Service - to provide an effective solution that achieves continuous performance improvement for our customers over the duration of our long-term contracts. To align our and our customers' interests, we offer different payment models such as per month, per ton or performance-based. For our customers, this results in improved plant performance, reduced capital employed and the benefit of 150 years of SMS group expertise in metallurgical plant building. ◆

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Digital commissioning

WE CREATE YOUR ASSET

To ensure harmonized interaction of all functions and smoothly running production processes from the very beginning, SMS group tests and optimizes the entire automation system of a plant under realistic conditions in its own test centers long before the plant is physically installed at the customer's facilities. SMS group has developed this integration test as an advanced digital commissioning method for automation systems. With an X-Pact® Plug & Work integration test, commissioning periods can be significantly reduced and ramp-up phases accelerated. Additionally, the integration test provides the opportunity for future plant operators to receive training from SMS group experts using the plant's original control pulpits.

With X-Pact® Plug & Work, commissioning periods can be reduced by up to 30 percent compared to a conventional commissioning procedure. For the integration test, SMS group experts first install the entire automation system for a customer's specific plant in the test center and then connect it with a virtual simulation of the plant and of the production process. The kinematic and dynamic behavior of all plant elements is simulated using mathematical physical real-time models and taking into account the technological characteristics of the plant. The result is a realistic simulation in 3D. As early as during the Plug & Work test, the digital twin of the entire plant, generated in parallel with the engineering process, can "go live" in test mode by feeding it with data from the simulation. Later, when the real plant is in operation, the digital twin will be further enhanced with online data.

Virtual hot commissioning

X-Pact® Plug & Work is not just cold commissioning. It is actually hot commissioning in a virtual environment. We test the interfaces for the drive units, the measuring systems and the functionality of the interfaces to the technology package using the same methods as we would in the physical environment at the customer's facility. First, we separately test the different plant modules. Then, we combine the individual modules to represent the complete plant and test how they interact. Subsequently, virtual production tests are performed based on the customer's actual production plan. Before the equipment and systems are delivered to the customer, the production reports and IBA-PDA data generated during the Plug & Work procedures are reviewed and evaluated jointly by SMS group technologists and safety experts.

Building on more than 150 years of experience in plant engineering and process technology, SMS group has the necessary expertise and know-how to understand how processes behave and how process parameters have to be set to achieve specific product properties. This guarantees high reliability, safety and quality from the outset, enabling an immediate production start, smooth plant operation and a short payback period.

Operator and maintenance personnel training

Training our customers' personnel under realistic conditions is an important ingredient of cooperation in partnership as SMS group understands it. While experiencing their training, the operating staff are encouraged to bring forward own

Service calls can be initiated directly from a smart phone via the mobile version of the X-Pact® Service portal.

ideas and give feedback. This highly practical approach assures direct participation of the customer's team in the commissioning process, actively supporting the ramp-up of the plant. The future operators and maintenance personnel train on the original control pulpits with data from the digital twin. The training includes personalized familiarization with specific plant functions. It is even possible to train in a virtual productive environment how certain operating situations should be handled.

Virtual customer training

Usually, the operators are physically present in the integration test center for their training experience. However, it is also possible to perform the digital commissioning and training sessions remotely. In other words: When the customer cannot go to the test field, the test field simply goes to the customer. For this, SMS group offers remote-assisted operator training within the environment of the integration test field as an alternative training method.

This is made possible by transmitting the entire plant simulation data to the customer and granting the customer's personnel access to the control interfaces, including the virtualized control room, the local panels and the HMI system. Thus, the training is entirely virtual. The customer's personnel operate the plant from their offices, while the SMS training experts accompany the training in a video conference, ready to answer any questions that might arise.

Remote support during and after the commissioning

X-Pact® Service provides SMS group the perfect infrastructure for rendering remote support services during and after the commissioning of a plant. Every new plant supplied by SMS group generally comes with the technical capability to use remote support services. SMS uses the secure connectivity of the X-Pact® Service portal to visualize the equipment and plant systems with AR goggles and directly communicate with the customer's specialist personnel via chat function, audio, video or whiteboards. This portal is used during the engineering phase, for the X-Pact® Plug & Work integration tests and to support the commissioning activities. In addition, a mobile version of the X-Pact® Service portal is available for the staff at the customer's facility to send out a service call directly from their smart phones. Within the global SMS group network, both software experts and technologists from our development and engineering departments are readily available to assist our customers with their questions. In this way, many issues can be clarified just by a call, an easy way to save costs and boost performance. ◆

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Turbo for digitalization

WE INCREASE YOUR PERFORMANCE

With an Industrial 5G infrastructure, SMS group is building the network of the future for the metals industry.

INDUSTRIAL 5G

has the potential to take the digitization of entire industries to a new level – and SMS group, as an industry pioneer, is now driving the agenda forward with a pilot project at its Hilchenbach site.

Also in the metalworking industry, digitization now plays an increasingly important role and is the stepping stone to a fully networked, autonomous steel mill 4.0. So far, however, the necessary broadband network has often been lacking to enable it – and that is exactly what Industrial 5G is set to change. The new technology offers high data rates, reliability, and precision as well as connectivity in real-time, while at the same time being energy-efficient, allowing the use of many devices even in a small area and ensuring improved safety for people and machines. As a result, even complex industrial processes can be fully mapped and optimized. Particularly companies that have not yet had a high level of digitization can achieve significant savings through wireless infrastructure based on 5G, not only in terms of materials but also in terms of energy consumption. In view of sharply rising prices for power and raw materials and supply bottlenecks caused by the current crisis, small and medium-sized companies, in particular, are more dependent than ever on using their resources efficiently. In addition, digital control of manufacturing processes helps to sustainably reduce errors in production and pave the way for a learning factory. According to data from the Federal Ministry of Economics and Technology (BMWI), companies in the mechanical and plant engineering sector estimate that savings of up to 25 percent can be realized through digitization. At present, 5G is the only technology that can cover the required performance spectrum and also network multiple locations. In the industrial sector, 5G provides localized radio networks that can be used either separately or in conjunction with public mobile networks. Since these so-called private 5G networks can be designed to be particularly secure and, unlike public 5G networks, keep the data within the company, it is also possible to effectively prevent cybercrime.

Regulatory sandbox for digital solutions

To provide customers with the best possible support on their transition to digitized production, SMS digital, a member of the SMS group, offers numerous solutions for predictive maintenance, product quality, production planning, and energy management - and is now taking a further significant step on the road to the networked factory by testing a 5G infrastructure at its plant in Hilchenbach.

"If you want to remain competitive, there is no way around digitization. And that means, that at the moment, there is no way around 5G," says Jens Petri, Head of Technologies & Partnerships CoC Asset Optimization at SMS digital. "To make its many benefits tangible, we have now set up our own Industrial 5G network infrastructure. This allows us to develop, test, and optimize digital applications in real-time. With this unique implementation of such a network in Germany, we act as a trailblazer for the industry."

The aim is to be able to offer customers provider-independent Industrial 5G Mobile Private Network solutions. The digital infrastructure that has now been established is a highly stable network that will help gather data and insights relating to predictive processes in practice and evaluate and control them intelligently with the aid of machine learning. In this way, the use of digital solutions will be intensively tested and made visible under real production conditions with a high cycle rate.

The learning steel mill

In parallel, the digital solutions employed in Hilchenbach are also being integrated into the demo factory of the Center Connected Industry (CCI) at RWTH Aachen University. This will enable testing in various environments, thereby providing further insights for development and optimization. Based on the experience gained in this way, SMS will in the future be able - with the support of a partner network - to set up Industrial 5G networks in its customers' plants that reliably ensure the exchange of data between edge devices and the cloud in real-time. A particular focus is on the interface issue. Thanks to wireless smart sensors solutions, production data from non-digitized machines can also be pulled up and included in the consolidated evaluation - without manufacturers having to disclose their trade secrets.

As a result, monitoring and control of complex production processes are taken to a whole new level. Aggregates that are not currently being tracked can now be integrated and made visible. 5G helps to adjust production by facilitating faster predictions without delay, thus avoiding downtime and wastage as far as possible. Not only does this have a positive impact on product quality, but it also helps companies make their processes more sustainable through the targeted use of information and resources - thereby significantly reducing their carbon footprint and driving green steel production forward.

"5G is the answer to many challenges the steel industry faces," emphasizes Jens Petri. "For a usually manageable financial investment, the technology offers considerable potential for savings and optimization by turning data into success and ensuring enhanced safety and sustainability. This way, we and our customers are strongly positioned for the future." ◆

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Intelligent interconnection of basic and process automation

WE INCREASE YOUR PERFORMANCE

With our X-Pact® technology, SMS group covers all the latest automation trends and, in doing so, creates a technologically self-optimizing plant that continuously enhances its product quality well after it has been put into operation.

Comprehensive technological know-how, a high degree of competence in the field of electrical and automation systems, and a variety of state-of-the-art software developments provide the basis for an integrated approach, from the sensor level to the latest developments in digitalization, which SMS group offers with its X-Pact® (Process Automation Control Technology) automation solutions. The digital-ready plants supplied by SMS group create the foundation for the fast and successful digitalization of production facilities. They offer advanced production standards and assured future viability. Together with the holistic solutions from Electrics and Automation, SMS digital, and Technical Service, a new standard in plant performance and productivity is being set.

The focus here is on the interaction between the individual areas of expertise: from the sensor-actuator level (level 0) to the technological control systems (level 1), physical process models (level 2), through to higher-level processes such as production planning. Thanks to a highly effective exchange of information inside the model, the open software architecture enables the intelligent interconnection of the basic and process automation technology to create a holistic technological solution.

DIGITAL READY

A plant is considered digital ready if its machine and automation data are described by means of context information (metadata) and data access information and published in a standardized manner via the supported interface technologies. In particular, this places high demands on the development of the software in terms of the data structuring.

Composing: Getty Images/Viaframe/ Sandipkumar Patel

Expert system in demand

WE INCREASE YOUR PERFORMANCE

As an integrated technological solution that comprises artificial intelligence and expert systems, X-Pact® Superior Control actively supplies superordinate product change strategy presets to the level 1 and level 2 automation systems.

- **All technological rolling strategies for almost all single-stand and multi-stand cold rolling mills can be mapped at a higher level by parameterization alone.**
- **This offers a high degree of continuity in terms of the quality of the technological automation products. It also generates strong momentum for the further development of the technological and digital solutions.**
- **The approach behind the introduced X-Pact® technology clusters also offers numerous new possibilities that could not be realized by conventional means. Now, for example, a product change in a pickling line/tandem cold mill can be executed with different strategies.**

The example of the use case taken from developments in cold rolling relates firstly to continuous pickling line/tandem cold rolling mills and is aimed at optimizing them with fully automatic technology. The range of available options include improving production planning or navigation-based process control for the operator. Here, the so-called product changes, the most challenging point in the continuous rolling process, were chosen first for optimization. With continuous rolling mills, endless strip is rolled, therefore when there is a strip change the mill does not stop, but rather it moves through the change normally at reduced rolling speed under rolling force and, in most cases, full reduction.

The challenges of strip and product changes during continuous rolling are the rapid shifts in the operating points. These are caused by an almost abrupt change in the strip properties and strip dimensions in the individual mill stands. Such changes, especially the significant ones, must be targeted as precisely as possible in order to ensure the plant's stability while at the same time satisfying the high demands regarding product quality parameters and productivity. Typical quality parameters include the strip flatness and the strip thickness tolerance. Therefore, the plant operator needs the greatest possible flexibility when selecting the product changes while at the same time ensuring stable rolling processes with high product quality.

The entire automation system with all its setting options, for example manual operator interventions and the technological control systems (level 1) right up to the pass schedules from the physical process models (level 2), are divided into so-called technology clusters. These technology clusters correspond to the final product quality criteria. As such, there are technology categories for the strip flatness and strip thickness, among other things. Contrary to the current state of the art, the automation system therefore no longer operates with individual values, such as a manual bending change, or an additional value for CVC® shifting from the flatness control system. With this new approach, the clusters are organized centrally according to their technological allocation and are controlled by it.

Variety of technological possibilities

The advantage of this step beyond the limits of the level 1 and level 2 systems is that interlinked and separately runnable structures can be mapped. In concrete terms, this means that unlike the current state of the art, the automation system does not require a fixed differentiation between the level 1 and level 2 systems. Both systems work in a closely connected and coordinated manner, thereby opening up a multitude of new technological possibilities.

The next step on the road to the Learning Tandem Mill is to take large amounts of data to develop an artificial intelligence that can take over higher-level control, i.e. over the technology clusters.

The basic idea behind this is: If a technologist can clearly find out from the data what technological mode of operation

would have been the most expedient for a given product change, then this can also be calculated. The largely good accessibility of the available data means that this calculation can be done independently of the choice of technological strategy.

In this way, an expert system is developed as part of X-Pact® Superior Control, which automatically calculates the optimum strategy for all product changes, i.e. the optimum combined method of operation from the technology clusters such as flatness, thickness, etc. This expert system provides so-called „labels“, data that subsequently indicate the optimal strategy for a product change that has already been carried out. This look back at the past can now be done as often as needed based on mass data. The next step, therefore, is to supply digital AI systems that are used to provide a forecast for the optimal product change strategy.

As soon as the artificial intelligence provides a sufficient hit rate in its prediction, it generates added value in the form of an improved off-gauge length for strip flatness and thickness and increased product change stability. This is because the proposed strategy from the digital AI system can directly be coupled to the control of the technology clusters of level 1 and level 2 systems. Using mass data as a basis, these AI systems provide optimized strategies for level 1 and level 2 systems and implement the presets in real time for strip changes. The objective is thus to create a technologically self-optimizing plant that continuously enhances its product quality over its whole life cycle. ◆

THE LEARNING [STEEL] PLANT

The integration of AI functions into existing operating and information technology enables industrial systems to exchange information across functional silos and to derive data-driven, actionable elements.

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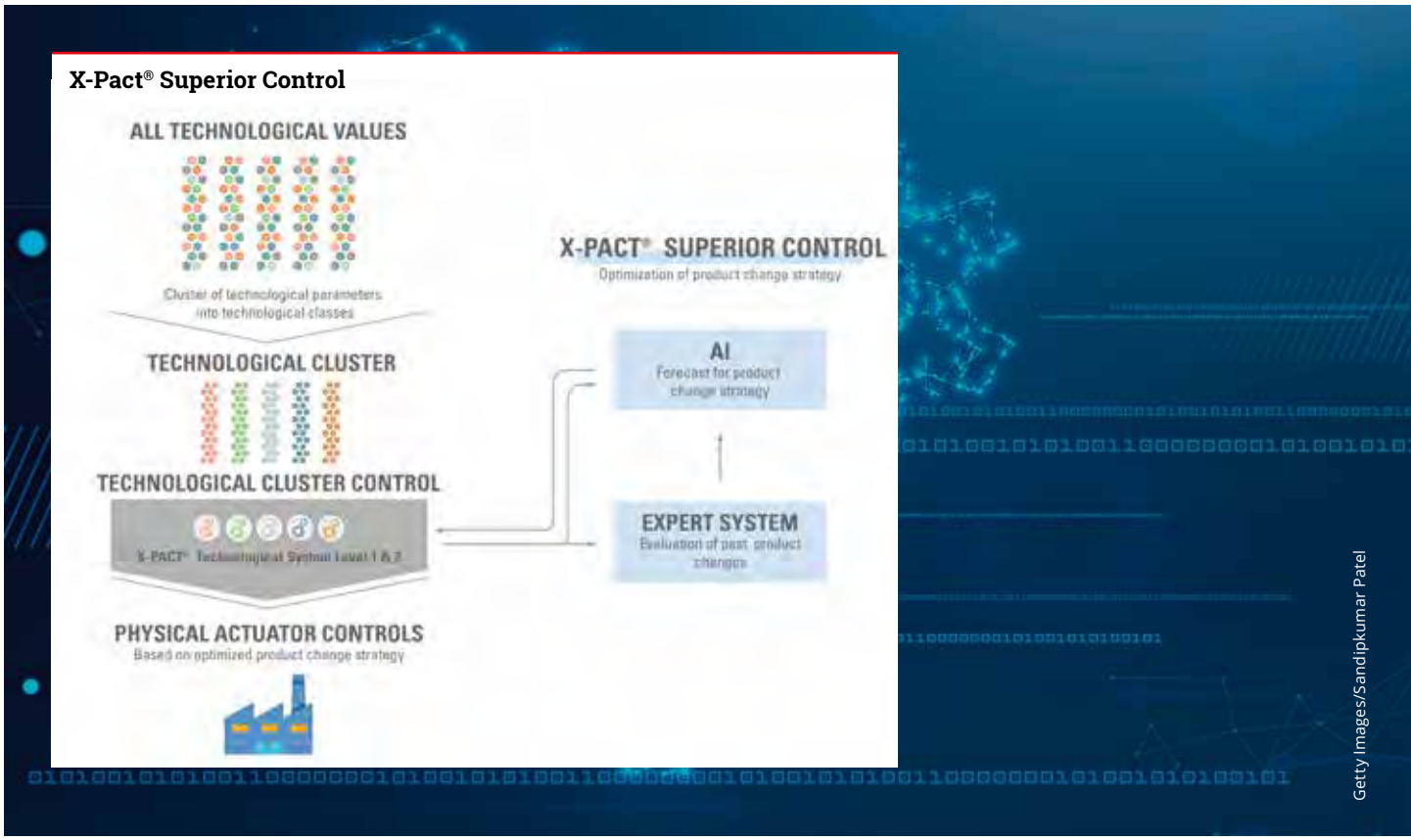

COIL GRADING

WE INCREASE YOUR PERFORMANCE

The Quality Execution System (QES) from QuinLogic, which includes automatic coil grading and coil release features, has become an established system in the market, as it has proved to make work for the quality control personnel a lot easier. QuinLogic, pioneers and technology leaders in quality management software for the metals industry, is a wholly-owned subsidiary of SMS group. In this interview, Helga Evers and Sevda Sarova explain why it is nowadays imperative for plant operators to have an efficient predictive management system in place.

For what kind of issues do your customers get in touch with you?

Helga Evers: Even today, quality management is still not an automated process in most rolling mills. The plant's personnel have to invest a great deal of time and effort in quality monitoring in order to find root causes for deviations. If there are quality issues, the monitoring personnel must take decisions and, if necessary, action, such as downgrading a coil or, in the worst case, scrapping it. What many customers are looking for is a solution that enables automatic coil release, ideally in all process steps. Our software is a market leader in quality management. It supports the quality

HELGA EVERS

is Vice President Sales & Marketing at QuinLogic. As one of the founding members of the company, she has been on board since 2008. She can look back on more than 25 years of experience working for suppliers to the rolling mill sector and has been a driving force behind the development of numerous innovative products.

SEVDA SAROVA

holds a Master of Science in Metallurgy & Production Technologies and has been working as a Technical Sales Manager at QuinLogic since 2020. She started her career in an industry association and has been active in the steel industry for over ten years in sales, marketing, and technical support.

control staff by automatically releasing all defect-free coils. It is obvious that this improves efficiency. And this is exactly what our customers value. As a result, many customers have been ordering extensions to their existing QES installations. Their satisfaction is proof of our success.

How does the QES exactly work? What are its special features?

Sevda Sarova: It is vital for a steel producer to supply coils that precisely meet the quality requirements specified by the customers. To prevent quality deviations, it is crucial that quality issues are detected as early as possible during production. For the assessment and grading of the quality, the QES uses comprehensive process, product and quality data from all production stages – from the raw material up to the surface-finished end product. These data are collected and centrally processed in the SMS DataFactory. In this way, previously hidden or unused data can now be extracted and analyzed to continuously enhance automatic, quality-based product grading as a first step, and then, as a second step, be able to perform correlation-based root cause analyses.

Findings from these analyses can be translated into new rules, thus making the grading and automatic coil release more precise – 24 hours a day, 7 days a week. If, for example, the cause of a defect has been found to be attributable to issues in one of the upstream processes, the effects of these issues become predictable. This knowledge makes it possible to avoid the defect in the future by adjusting the upstream processes accordingly. Added as newly formulated rules, this knowledge helps to learn from mistakes, make automatic coil grading and release processes more reliable, and produce coils of a better quality.

Helga Evers: Typically, release rates of 50% are achieved soon after the start of a project. The rates increase continuously as more and more quality issues are evaluated and more precise rules can be formulated as a result.

Our LogicDesigner module assists quality experts with the formulation of new rules and the optimization of existing ones.

Can customers also identify the specific causes of deviations in this way?

Helga Evers: Yes, that is the ultimate goal! Rule-based grading is used to pinpoint quality deviations, and the DataCorrelator analyzes their causes. Every year, QuinLogic holds a user meeting to present new software releases to customers and collect ideas for further QES developments. This conference offers important insights: For example, detailed findings on the correlation between strip tensions and surface defect clusters in a new production line were used to optimize the line and ensure a faster run-in. In another case, it was identified that a combination of several parameters was responsible for the formation of cracks.

In fact, another module plays a crucial role for all data-driven applications here: the genealogy module. This module tracks data related to the coil as well as control system data from the liquid phase up to the final product. In other words, data for every single coil can be traced back to their origin. According to customers who use the genealogy feature, the possibility of tracking the process parameters and quality data for a coil from upstream process stages opens up new ways of optimizing both processes and quality.

Sevda Sarova: There are also examples where the "neutralized", fact-based analysis of the cause of quality deviations has led to more efficient cooperation and communication between the quality or process managers at the relevant stages of the process - another important effect that should not be underestimated! Proactive quality management is taken to a completely new level.

How does the QES communicate with other systems?

Sevda Sarova: The data integration, which is part of every QES implementation, supports digital connections between the various production stages, sectors and supply chains. It enables users to improve collaboration, coordination and transparency. To put this in visual terms: The QES is a kind of "data octopus" that links and evaluates all process and plant data and makes them available to other systems – as production planning, for example. Thus, the sequence of production orders can be adjusted repeatedly, as required, based on the specified quality.

Many plant owners have difficulties with data availability. How does QES solve this challenge?

Helga Evers: Many rolling mills use very heterogeneous data landscapes. Therefore, QuinLogic decided very early on to develop tools like Data Integration Studio, which supports data connection and unified access to the data, while leaving the actual data in their original data sources. For longterm storage, which provides the possibility of performing data analyses at any time, we offer the SMS DataFactory. During the implementation phase,

The QES checks whether a specific product meets the customer's specifications by taking into account quality and process data from all production steps. In this way, it can automatically release and certify the product quality.

our experts connect the data sources of the customer's system with a central data server. Both the raw data and the data prepared for the respective application are stored in this server. The data preparation also includes the transformation from timestamp to position-based data. The available data to be integrated may come from the ERP system, the process or manufacturing control system, such as our MES 4.0 or other databases. Moreover, data from systems measuring the width, thickness, flatness, profile, temperature or strip edges, as well as from surface inspection systems, are integrated. In addition to this, data cleaning and consistency checks can be performed with this solution.

Can data also be exchanged across plants?
Helga Evers: Yes, that is possible. We implemented such a solution at Liberty Steel and Cleveland Cliff (former AK Steel), for example. These customers can now track the data back to their sister plants and use them for analysis.

How can digital applications support more sustainable production?
Sevda Sarova: Intelligent quality management is not only about preventing that a defective product is delivered to a customer. Above all, it is about ensuring that these defects do not happen at all - by detecting and eliminating the conditions that may lead to defective products. This is where predictive systems come in: They use intelligent strategies and analyses based on machine learning to avoid production issues. The data they generate can additionally be used to make more precise calculations of the required feedstock. This significantly reduces downtimes and saves valuable resources and energy as a result.

The reduction of CO_2 emissions is another aspect of sustainable production. The steel and aluminum industries account for about 7% of global CO_2 emissions. Every year, 4.4 billion tons of CO_2 are emitted by steel producing companies. With its intelligent software solutions, SMS actively promotes the transformation to green steel production. The objective here is to make production lines more efficient, optimize equipment use, enhance product quality, and reduce emissions – and ultimately save energy and valuable resources.

QES monitors, logs and assures product and process quality along the entire production chain – from the raw material to the surface-finished end product.

QuinLogic is an established software solutions developer on the market. Why did you decide to operate under the umbrella of SMS group?
Helga Evers: SMS group has more than 150 years of experience in metallurgical plant engineering and extensive process expertise. This, combined with digital know-how, enables us to offer our customers plant and equipment, services and digitalization from a single source. We provide solutions that can predict how the condition of plants, equipment and product quality is going to evolve. Our solutions optimize production planning and support efficient energy management. With SMS, customers choose a full-service provider who has the capacity and expertise to realize full-fledged digitalization of their entire production. Expertise in intelligent quality management provides a perfect complement to SMS group's digital portfolio. This enables us to pool resources most effectively and make optimal use of our resources to the benefit of our customers – along the entire production chain. ◆

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Consulting services for process optimization

WE INCREASE YOUR PERFORMANCE

Dr. Boris Feige and Thomas Hüper discuss consulting activities at SMS group.

SMS group supports its customers with a comprehensive range of maintenance services and automation solutions. As a full-service provider, SMS also offers a wide range of consulting services for the holistic optimization of production processes. The Newsletter team talked with Dr. Boris Feige, Chief Operating Officer at SMS digital, and Thomas Hüper, Technological Consulting Lead at SMS group, on the company's approach to consulting.

What kind of consulting services do you offer and what are the specific issues customers want to discuss with you?

Boris Feige: Customers contact us with a wide range of problems. These range from quality issues during production to the introduction of new steel grades and decarbonization, through to the development of digitalization strategies and their implementation in concrete applications. Access to SMS group's wide-ranging know-how means we can offer support in almost all areas of steel production. However, our focus here is clearly on the questions and issues of our customers that are closely related to production.

Thomas Hüper: This is one of SMS group's great strengths. Our expertise covers the entire production process – from the production

A flawless surface is crucial for product quality.

of crude iron through cold and hot forming right up to surface finishing. We call in experts of different skillsets, as needed to solve the specific problem. For example, some projects may require metallurgists working together with operation and maintenance experts on the optimization of "tap-to-tap time", i.e. the time between two taps of an electric arc furnace. We assemble the teams to suit the individual requirements of the customer.

Why is SMS group as a machine and plant builder focusing on the consulting business?

Boris Feige: SMS group has been much more than just a machine and plant builder for a long time. Our growing service business and activities in the field of digitalization underline this development and are gaining ever-greater relevance. SMS group sees itself as a provider of solutions directly related to the specific challenges of our customers.

Thomas Hüper: And this includes, besides selling plants and equipment, supplying spare parts and maintenance services, the joint processing and resolving of completely different, customer-specific issues. After all, our interaction with the customer does not end with successful equipment commissioning. In many cases, this is the time when it starts for the consulting team. We want to be a reliable partner for our customers throughout the entire lifecycle of the facilities we supplied and work together with them on optimizing their key production performance indicators.

Can you give us some specific examples?

Thomas Hüper: We were contacted by a customer struggling with reduced quality issues in his continuous galvanizing line. He had been experiencing a rising number of surface defects comprising so-called "dross pimples" and "black spots", and neither he nor his team were able to identify the cause. We immediately selected a team consisting of a quality expert for galvanizing lines and an automation specialist. For two weeks they stayed on site to conduct an investigation, monitor production processes, conduct microscopic sample analyses, and to inspect the line during a scheduled shutdown. The analysis showed a number of reinforcing effects, such as damage to the cold-rolled ingoing material due to relative movements of the strip and the rolls. In addition to the root cause analysis, concrete measures were prepared and implemented subsequently, and brought about a reduction in the number of errors.

THOMAS HÜPER

is head of technological consulting at SMS group and has more than 20 years of experience in quality management and technological consulting in the metals industry.

Boris Feige: Another interesting example is the analysis of intralogistics in a hot rolling mill, the downstream pickling lines and associated coil stores. We examined the logistics nodes in the value chain and all related weak points with direct influence on the logistical parameters, deadline compliance, lead times, stock and capacity utilization. The greatest influencing factor was the wide range of lead times tying up considerable stock levels. Also, we identified crane facilities and warehouse fill levels to be capacity bottlenecks preventing an increase in the future production volume. Jointly with the customer, we developed measures to improve adherence to deadlines in the production area under review, tied them in with concrete savings potential to quantify the cost-benefit effect and make it tangible for the customer.

These are interesting examples of customer projects also demonstrating the range you offer. Do you follow a specific consulting approach in your projects?

Thomas Hüper: We always design our consulting approach in line with the customer's requirements. Due to the individual wants and needs of our customers and the range of topics and issues, there is no "one size fits all" solution. Nevertheless, four principles can be singled out which all projects have in common and which form the basis of our philosophy. The first principle is "Best in class": We only staff our projects with established experts. With more than 450 specialists within SMS group, we cover the entire steel production process and can specifically rely on dedicated expertise in individual disciplines, for example operations, metallurgical process control, quality management, digitalization, intralogistics, or energy consumption optimization.

The second principle can be described as "Local": Our principle of being local whenever possible implies that we always work on the customer's issues together with him on his own premises. Whether it's in Inner Mongolia, Egypt, or Brazil. We do not waste time in getting to the customer's site, exactly where he needs our support.

Boris Feige: Also very important is "Quantify": In providing consulting services, we see ourselves as being more than mere analysts, but rather

our objective is to define concrete measures for implementation. Quantifying our activities and measures is of particular relevance for our customers. Consequently, the goal is always to bring about a concrete effect of the defined measures on the profit and loss account and to demonstrate it in this manner. This is the only way for us to achieve the necessary commitment and for the customer to obtain a valid basis for corresponding implementation and investment decisions.

The last principle is "Execute": Our consulting services do not end with the analysis and definition of measures. We also support our customers in their implementing activities. This makes us stand out from established strategy consultation services. We at SMS group can adapt the equipment, corresponding automation systems, and the operating parameters as and when required. In addition, we also develop and implement digital solutions to ensure the ideal operating points of our customers' facilities. We have a whole toolbox filled with options for implementation. This is how we translate consulting service theory into concrete implementation.

BORIS FEIGE

is Chief Operating Officer at SMS digital and leads its consulting activities. He looks back on more than seven years of consulting experience.

So, customers get everything from a single source at SMS?

Thomas Hüper: Yes, for all phases within a plant's life cycle. With SMS, our customers opt for a full-service provider. Bundling the competencies of SMS group in the fields of Electrics & Automation, Digitalization and Technical Service, we can offer integrated solutions that aim to boost the performance of a plant and maintain it over its entire life cycle. In combination with performance-based business models, we are able to enter into long-term partnerships with our customers, who can thus fully exploit the benefits of our products and services. Our service business generates solid and stable margins, and additionally contributes to innovation and regular exchange with our customers. In this way, we are able to secure our innovative strength and competitive advantages in the long term.

What plans do you have for the future?

Boris Feige: In the last three years, we have been able to further expand our range of consulting services and implement a host of projects for customers. Our aim is to maintain this growth path. To cope with the rising demand, we are extending capacities in markets such as the U.S.A., China, India, Europe, and South America. Going forward, we will merge our consulting services even more in integrated teams. These include our digitalization, maintenance, and electrical and automation experts as well as the entire spectrum of metallurgists. ◆

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Service from a single source

WE MANAGE YOUR LIFECYCLE

The example of North America illustrates the transformation of SMS group towards an integrated solution provider.

The service location in Osceola, Arkansas.

"With the deep know-how we have acquired over the years, we are able to tailor the workshop machining equipment to the customer's requirements with the aim of maximizing efficiency. Our employees are committed to driving process and innovation while strengthening our capabilities to meet our customers' needs."

Brian Rea,
VP of Technical Service, Americas

It is not digital transformation alone that changes the plant and mechanical engineering industry, the change from a manufacturing company to a provider of integrated solutions is in full swing. A factor of crucial importance in this process is service. Rendering services for plant operators has long ceased to be a follow-up business, but turned into a profitable business segment of its own. SMS group is one of the pioneers in this field and is consistently expanding its service offering with new holistic concepts and innovative strategies towards the digital future. This is particularly evident in the Technical Service in North America.

SMS group's business activities in America can be traced back to the year 1900, the beginnings of Oilwell Supply Company and Aetna Standard Engineering Company in the Pittsburgh area. Currently, SMS operates 20 local service locations in North America, all of which are located close to or directly at the customer's site.

One of these locations has been established on the premises of Big River Steel in Osceola, in the U.S. state of Arkansas, where SMS operates roll shops for the hot strip mill and the cold rolling mill. In its vicinity there is a further workshop for mold and segment repairs. In addition to the classical maintenance and repair work, this

"We at SMS group do not reduce customer orientation to just mentally identifying ourselves with the tasks of our customers. We are always on site, exactly where we are needed. Our employees use the latest methods and approaches to generate value from data and improve operational sequences and products."

Katja Windt,
CDO SMS group

"Our aim is to be a reliable partner for our customers and to support them in taking maximum advantage from their facilities. This is why we stay in close and direct contact with our customers and provide demanding repair and maintenance services for optimized plant performance."

Brian Rea,
VP of Technical Service, Americas

workshop is equipped to apply special coating processes such as NanoGuard® and UniGuard®. These copper, nickel and nickel-alloy coatings significantly prolong the service life of copper molds. The reconditioning of molds is a unique selling point in the market, since all defective molds in the U.S.A. are ending up in the specialized workshops of SMS. This is something special, too. Generally, service work can be carried out in the workshops for all types of equipment and facilities - from simple repairs to combined lifecycle solutions.

The next step is assistance in maintenance activities and necessary repair work. Especially for maintenance, SMS group offers numerous different models, from customer support through SMS specialists up to the complete scope of maintenance services for defined areas. Such subscription models are sought after

The reconditioning of molds is a unique selling point in the market, since all defective molds in the U.S.A. are ending up in the specialized workshops of SMS.

in the United States. Just recently Big River Steel selected SMS for an expansion of its partnership to include new hot and cold rolling mill services, in addition to an on-site caster overhaul facility. This contract will almost double the existing service area to support the new Big River Steel mega-complex.

What's more, SMS group has been awarded a long-term service contract from Nucor Steel Corporation for the continuous slab caster of the new heavy plate mill in Brandenburg, Kentucky. Here, SMS group can offer its customers integrated solutions enabling an increase in plant performance by combining own mechanical, digital and EA know-how. ◆

Brian Rea
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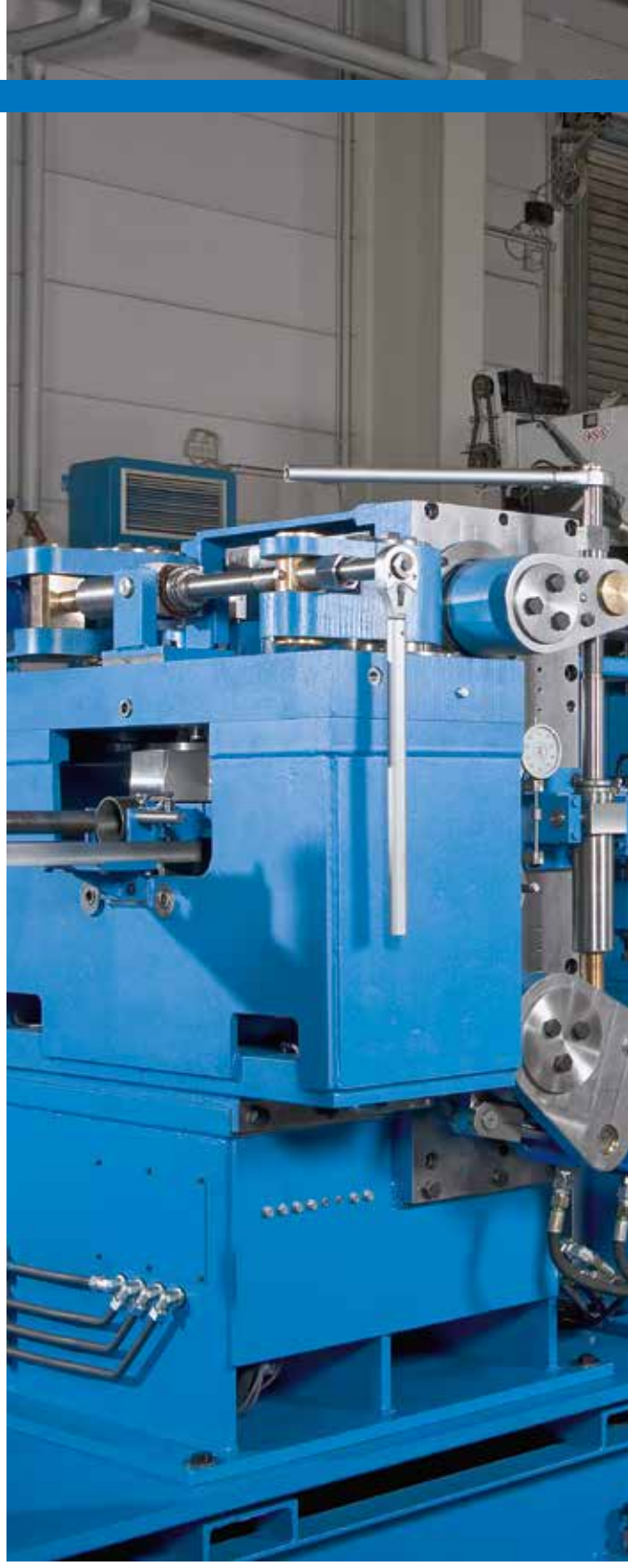
"I am proud of the employees in our U.S.A. workshops. They are 100-percent customer-oriented and make a vital contribution to the success of the company's Technical Service."

Doug Dunworth, CEO, SMS group Inc

Emergency repair of a different dimension

WE MANAGE YOUR LIFECYCLE

The example of Deutsche Edelstahlwerke shows how SMS group stands by its customers worldwide providing specialist support and expertise even in extreme situations.



The disastrous flood in Germany and some neighboring countries in July 2021 shocked not only the regions concerned, but the entire world. Immediately after this natural catastrophe, SMS group contacted its customers located in the flooded areas in Germany, Belgium and Austria with the aim to find out whether and how the company's service experts could help and support its customers.

One of the customers severely hit by the floods was Deutsche Edelstahlwerke (DEW) in the city of Hagen, Germany. A major part of the bright-steel processing line had been entirely submerged and was in a desolate state as receding water revealed. So, DEW immediately took advantage of the assistance offered by the Technical Service of SMS group.

Following a damage survey at the Schumag PM0 bright-steel center and the RSM 60 grinder, the specialists of SMS group, together with local companies, developed a detailed repair schedule. The scope of measures included completely new machine cabling, complete cleaning and flushing of all hydraulic lines, repair of mechanical equipment and

The completed original machine prior to delivery to DEW.

"It was the right decision to entrust the OEM Service with this complex task. Thanks to the excellent support by SMS group, we were able to return to regular operation soon after the flooding."

Thomas Möller, Plant Manager DEW Hagen, Germany

restoration of the entire automatic system. Thanks to its large supplier network, SMS managed to procure at short notice even parts with long delivery times and thus to avoid any stop of repair activities. DEW could restart production after a break of merely eight weeks. ◆

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SMS group's worldwide coating know-how converges in the new Coating Competence Center (CCC) at the Mönchengladbach location.

THE FUTURE OF COATING

THE NEW COATING COMPETENCE CENTER

CORE SERVICES OFFERED BY THE CCC AT A GLANCE:

- **Execution of coating orders for customers**
- **Technical consulting on coating systems**
- **New developments and verifications**
- **Test coatings for field trials**
- **Support with documentation and specifications**
- **Training and best-practice workshops worldwide**

They extend the service life of offshore wind-powered electrical generators, of gas and water pipes. Moreover, they can be used for preparing expensive wear parts in an economical and resource-saving way. We are talking about innovative coatings – true multi-talents with enormous potential. But how can we tap this potential if we don't know what challenge comes next? The answer is: jointly. With an experienced partner who, at the same time, is willing to question existing solutions: What kind of method is best suited for what purpose? What is the perfect coating material for the planned application? Will it pay off? What new coating solutions are there? And how does digitalization help with this? SMS group provides answers to all these questions.

The group's worldwide coating know-how converges in the new Coating Competence Center (CCC). Here, the latest development activities are tried and tested jointly with strategic partners from science and industry until they are ready for industrial use. All with the aim to support international customers with holistic services and develop new solutions in the worldwide SMS group coating facilities. The CCC is working on novel coatings as a substitute for hard chromium, for example, and on optimized coating systems for copper plates used in continuous casting processes.

One partner, all services

Ulli Oberste-Lehn, Project Manager Coating Competence Center of SMS group, says: "With the CCC, we have got a central unit that networks and supports our existing coating sites around the globe. In this way, we develop coating solutions for our customers all over the world that are precisely tailored to their needs." The CCC sees itself as a flexible partner who delivers solutions meeting the requirements for each specific use - from the development of new coating layers to the provision of services. Prof. Dr.-Ing. Katja Windt, Member of the Managing Board of SMS group, supplements: "The newly created Coating Competence Center is further proof of SMS group being well positioned for the future when it comes to special technologies. The center benefits from our many years of experience in the coating of furnace rolls, zinc bath rolls and copper plates for continuous casting applications. Here, we develop technologies that help our customers achieve higher plant availability, among others. Supported by our digital solutions for predictive asset optimization, we can actively extend the service life of plant components and avoid unplanned downtimes."

To this end, the SMS group experts also cooperate with universities ensuring that knowledge is exchanged and transferred at the highest level. In addition, regular quality controls are carried out in the laboratory of the CCC.

"We have set ourselves ambitious goals and are aware that we cannot achieve them on our own. That's why we founded the CCC on the basis of long-term partnerships with scientific institutes and plant operators," explains Oberste-Lehn. "Of course, we also work with conventional one-off contracts, but what we primarily offer are performance-based models that allow the customer to focus on his core processes and secure the positive profit contribution of the SMS solution during the contract period."

More sustainability through modern coatings

Coatings are an important factor when it comes to sustainability. And the trend keeps on growing. This is because, in addition to significant cost and process benefits, they ensure an extended life cycle of plant components and thus

"With the CCC, we have got a central unit that networks and supports our existing coating sites around the globe. In this way, we develop coating solutions for our customers all over the world that are precisely tailored to their needs."

Ulli Oberste-Lehn, Project Manager Coating Competence Center, SMS group

prevent construction or installation of new equipment - and the considerable energy and resource consumption associated with it. "The role of coatings in terms of carbon footprint will continue to grow significantly in the future," predicts Ulli Oberste-Lehn.

Exemplary of the environmental aspect are component repairs and modernizations which are part of the CCC service portfolio, too. One of the processes used for this work is the PERFECT spray® (Wire Arc Spraying) arc spraying system. It permits heavily loaded components that have been worn or damaged during operation to be repaired by means of thermal coating. PERFECT spray® is a development for a new field of application and based on SMS group's PERFECT arc® digital welding technology. Ulli Oberste-Lehn says: "In this way, we think technologies ahead to the benefit of our customers and efficiently pave the way for new applications."

In addition, the Coating Competence Center, with its globally connected coating sites, uses technologies such as high-velocity oxygen fuel spraying (HVOF), plasma spraying and buildup welding, and offers extensive support to customers and partners. For example, the wear of copper plates can be reduced by a factor of 2 to 4 in comparison with conventional coatings thanks to the inhouse developed UNIGUARD® coating. Further optimization of the coating systems used is part of an ongoing development project at the CCC.

The journey has just begun

From higher resistance to wear, corrosion or temperature to optimized properties such as improved tribology, self-lubrication or non-stick surfaces - the range of coating applications is already wide today. And yet, according to the SMS experts, this is just the beginning. "Anyone who wants to get to know, advance and benefit from the trend-setting possibilities and opportunities of modern coatings should talk to us. We can offer the bundled know-how of interdisciplinary teams - from coaters to process experts to plant engineers and digital experts. All parties interact perfectly. Our activities in the Coating Competence Center are not restricted to optimizing existing solutions, but we also research and work intensively on promising processes that open up completely new perspectives to our customers and to the markets," says Oberste-Lehn, describing the growth potential.

Prof. Dr.-Ing. Katja Windt concludes by emphasizing the relationship with the customer: "It is important to us that we develop solutions not only for our customers, but jointly with them. Being close to our customers, we know their challenges and can develop specific solutions on a partnership basis. This creates new future prospects for coating technologies that bring our customers substantial savings in process costs and quality improvements in the end product." ◆

Contact
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Further information
www.sms-group.com/thermal-spraying

Towards green steel production

Under the headword #turningmetalsgreen, SMS group has developed a decarbonization strategy and technologies able to make steel production green. This enables our customers to achieve their short, medium and long-term targets of CO_2 reduction.

#turningmetalsgreen

A short documentary interviews key change leaders in our company, exploring their work and how they are pushing the development of our company and its green metals ambitions. Watch this video to find out about SMS group, about our cutting-edge technologies, and about how renewable hydrogen is going to change the face of the metals sector.

Mission possible: #turningmetalsgreen

The steel industry is facing a central challenge: the climate change. Producing steel accounts for about eight percent of global CO_2 emissions.

Nevertheless, the steel industry is in a rather comfortable position as the technologies it takes for a change are already existing and waiting to be implemented - which is a lot more than other industrial sectors with similar climate change challenges can claim for themselves. And the new technologies have a high leverage effect as the example demonstrates: using one ton of climate-neutral hydrogen in steel production saves around 26 tons of CO_2 compared with the classic blast furnace route.

SMS group, with its unique experience, in-depth understanding of processes and technological know-how, is ready to play a pivotable role in the transformation of the steel industry, and this is not restricted to just comply with guidelines and regulations. The goal is to enable the customers to become leaders in the transformation of the metals industry.

The big opportunity: steel industry decarbonization

Let's look at the scope of the challenge first: Today, 1.3 billion tons of crude steel per year are produced in integrated steelworks generating 90 percent of the steel industry's total CO_2 emissions. This means more than 30 million tons of crude steel capacity will have to be "decarbonized" every year to reach the specified national climate goals. The question is how to approach this mammoth task.

Obtaining hot metal in the primary stage of iron and steel production generates more than 80 percent of greenhouse gas emissions. Due to the long investment cycles for metallurgical plants and equipment, a large proportion of the required CO_2 reduction must be achieved from ongoing operation of existing blast furnaces.

The good news is that there is a lot of optimization potential in the classic blast furnace route, foremostly in the form of hydrogen or hot syngas shaft injection, which can reduce the CO_2 footprint of a blast furnace by a respectable 30 percent and has the added advantage of lowering OPEX thanks to

the coke rate decrease. The 2021 coke oven gas dry reforming pilot plant that SMS group company Paul Wurth has put into commission in Dillingen at ROGESA Roheisengesellschaft Saar mbH, a subsidiary of Dillinger and Saarstahl, is off to an excellent start.

Converting existing integrated metallurgical plants requires a thorough reassessment of infrastructure and energy balances. This is hardly possible without the expertise of large-scale plant engineering. As an integrated solution provider, SMS group offers a full range of pathways for cost-effective CO_2 emission optimization of blast furnace-based operations.

The hydrogen century

The future of steelmaking clearly belongs to hydrogen. The fastest way to climate-neutral steel will be to replace the classic carbon-based route from blast furnace to converter with a hydrogen-based route using direct reduction processes and steelmaking in electric arc furnaces. SMS group has been a pioneer in electric steelmaking and energy-efficient minimill technology.

Hydrogen is already an integral component in a series of projects SMS has implemented for customers all over the world. But until the time when sustainably produced hydrogen will be available at competitive prices, there are some exciting examples of intermediate solutions SMS has already realized.

One of those successes is the record-setting MIDREX® DRI facility that SMS group company Paul Wurth supplied to Tosyali Algerie in 2018, which produced 2.28 million tons of Direct

Reduced Iron (DRI) in a natural gas-based process in 2021. Compared to blast furnace ironmaking, the MIDREX plant has a 50 percent lower CO_2 footprint. It also has the flexibility to progressively change to hydrogen – by up to 100 percent for full decarbonization – with only moderate modifications to the plant's setup and operating parameters. Tosyali Algerie validated the project's success in 2021 with a second order for a near-identical plant at another location. The additional production capacity will enable Tosyali to extend its presence in the international steel market. In one stroke, it becomes a technology leader in the industry's decarbonization efforts whilst also contributing to the economic and industrial development of Algeria.

A partnership for green hydrogen

When the metals industry needs hydrogen, and a hydrogen production specialist is looking for inroads into the metals industry, this is a very rare match and the reason why in 2019 SMS group became a lead investor and technology partner of Sunfire GmbH.

The German company developed an efficient process for high-temperature electrolysis, which differs from the classic electrolysis in using steam instead of liquid water, as steam is easier to separate into hydrogen and oxygen. The process can use steam generated by industrial off-heat and is hence suitable for all steelworks. This makes it much more efficient and offers the additional advantage of saving 20 to 30 percent energy compared to classic electrolysis.

The strategic partnership creates a solid and strong basis for linking hydrogen production with the steel industry and represents the kind of forward-thinking approach that opens up integrated, state-of-the-art solutions for our customers.

Future prospects

The steel industry is well positioned to make a significant impact on creating a more sustainable future by turning metals green. SMS has the innovative strength, spirit of partnership and profound expertise, all deeply embedded in its corporate culture, to be a major force in the steel industry's transformation. And this is what our customers, politics and society expect us to be. ◆

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The revamped coke oven battery makes an important contribution to future sustainability.

Emissions reduced and life extended

SWEDEN

SSAB EMEA saw the successful completion of its coke oven battery revamp in Luleå.

The scope of work included engineering, procurement and construction for the replacement of the raw gas system, along with the ascension pipes, goosenecks, the single oven pressure control (SOPRECO®) system for emission reduction, gas collecting main and off-takes.

The replacement of the entire raw gas system was carried out with the 54-oven coke battery in operation. This was in order to minimize production stoppages and guarantee sufficient coke oven gas availability for the heating up of the battery itself. Additionally, using an innovative technique, the battery ovens' roof, including several upper refractory layers, transversal and longitudinal tie rods and the charging machines' rails were substituted.

The 'completeness based' project achieved the required performance level in record time: about 22 months from order award. The team successfully overcame the constraints of COVID-19 during the design, procurement, delivery and installation phases.

Flexible project concept

The sales and proposal team responsible for developing the project concept remained in charge of project implementation after the receipt of the order. As a construction and commissioning-driven project several design features were studied and optimized during implementation in order to speed up installation (pre-assembly concepts), faster start up (pre-tests), and a reduction of production losses (erection and commissioning methodology focussing on coke production saving).

Finally, the mitigation of erection risks was managed by having a range of potential scenarios established in advance. This facilitated the quick reorganization of activities in case of adverse weather conditions.

The team had the customer's firm support for, and commitment to, the project. This successfully completed work means the 54-oven battery will have an extended and environmentally-friendly cokemaking operations lifecycle, thus promoting future sustainability. ◆

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Pilot dry reforming plant

GERMANY

The start-up of a pilot coke-oven-gas dry reforming plant for syngas production in Dillingen at ROGESA Roheisengesellschaft Saar mbH is a milestone in the development of dry reforming technology. “The aim of this development is to maximize the reutilization of steelmaking process gases, namely blast furnace and coke oven gas, in the steel production process. The end goal is to lessen the use of coking coal”, said Georges Rassel, SMS group Europe.

As one of the most important partners of Dillinger and Saarstahl on their decarbonization mission, SMS group will continue to support the steel producers in their transformation efforts. As part of this transition, dry reforming is being used to produce syngas using a completely new high temperature, catalyst-free reforming process.

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MIDREX® plants use a natural gas-based process.

MIDREX® reduction plant sets production record

ALGERIA

As Tosyali Algerie A.Ş. celebrates shattering the world record for annual production by a single module DRI plant, work on building another, near identical facility has already begun. The record-setting MIDREX® DRI facility was supplied by Paul Wurth in 2018. It has since been a success, nearing its theoretical design capacity of 2.5 million tons of both hot and cold DRI per year. This success motivated Tosyali to invest in boosting its production capacity by a further 2.5 million tons with an additional MIDREX® DRI plant to complement the existing one at its steelworks in Bethioua (Oran). Dr. Thomas Hansmann, Head of Metallurgy at SMS group said, “Being part of the new project is a privilege for us.” MIDREX® plants produce high-quality hot and cold DRI products from iron ore using a natural gas-based process. Compared to blast furnace ironmaking, a standard MIDREX® natural gas plant has a significantly lower CO_2 footprint. It also has the flexibility to progressively replace the natural gas reducing agent with hydrogen – up to 100% – with only minimal medication to the plant’s setup and operating parameters.

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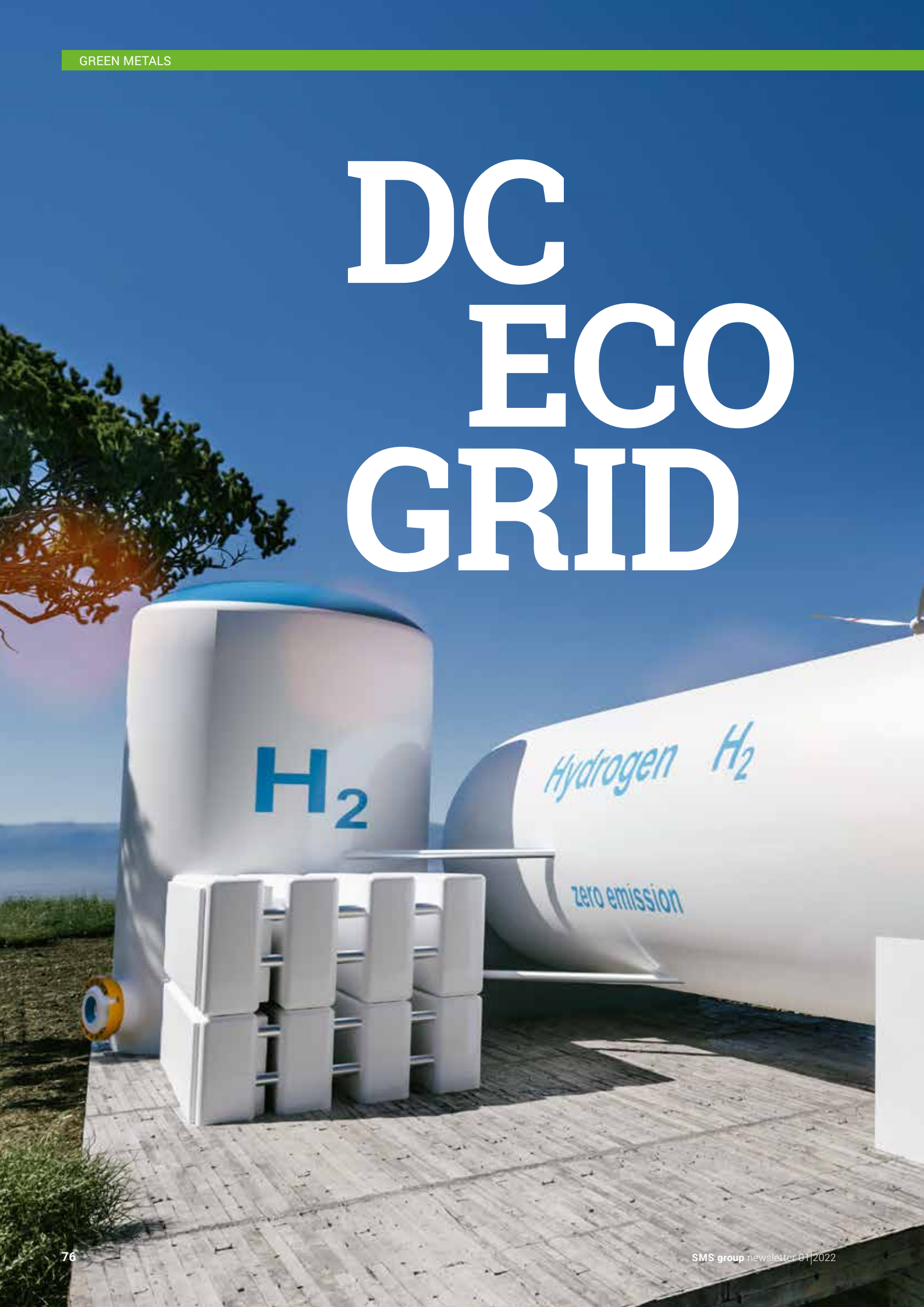
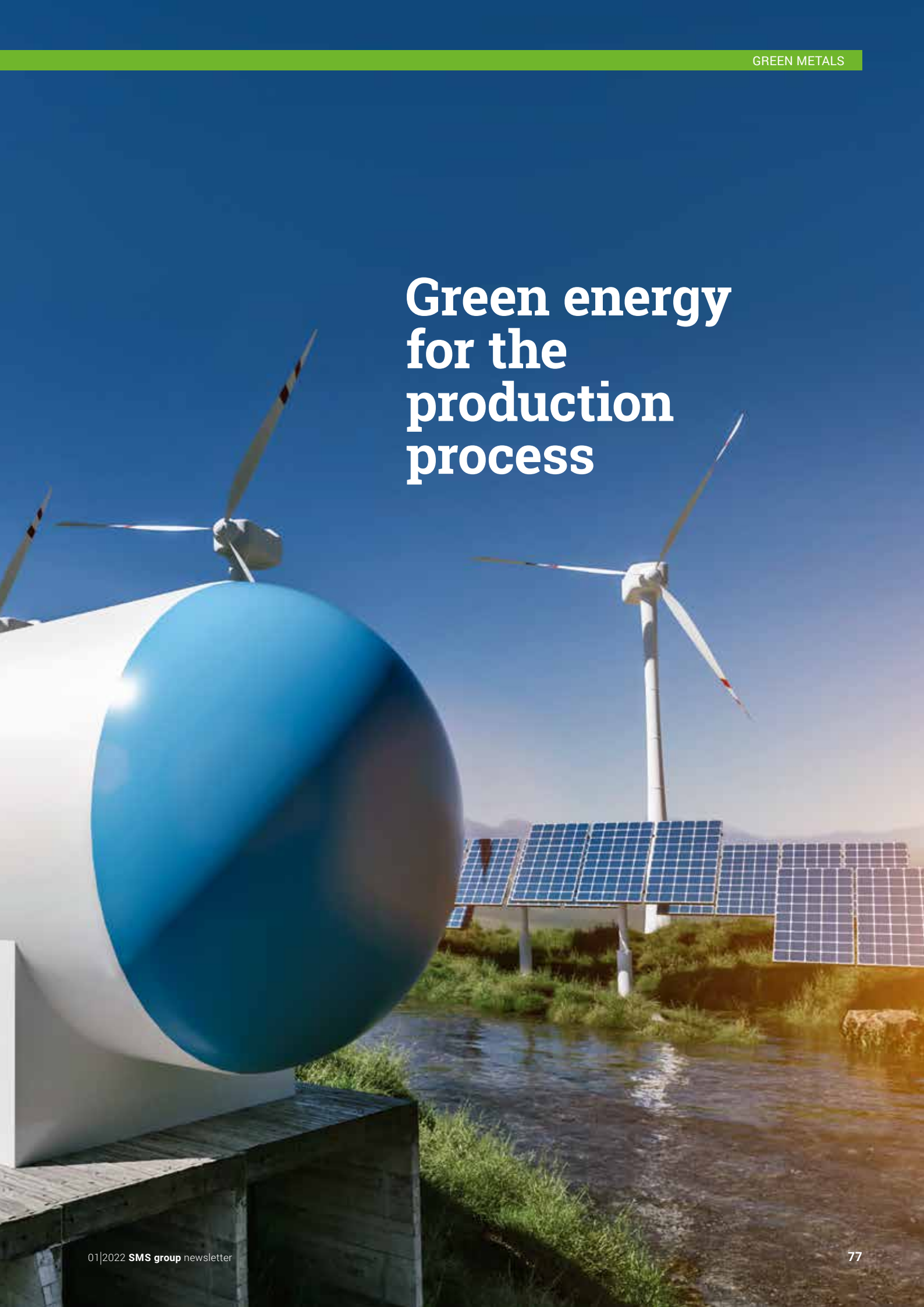
DC ECO GRID



Green energy for the production process



The path to green power supply from SMS group's DC ECO GRID.

The metals industry is on its way to replace the high CO_2 emissions generated by the use of fossil fuels with renewable energies in order to achieve climate-neutral steel production. Rising prices for fossil fuels and the increase in CO_2 taxes are further incentives for switching to a climate-friendly energy supply. Due to the increasing use of renewable energy in the form of hydropower, solar energy or wind energy, the AC grids currently used in the industry need to be adapted. By establishing DC grids, solar energy, for example, can be fed in directly – and thus more efficiently.

The DC ECO GRID from SMS group helps to provide a greener, more energy-efficient power supply for steel plants, both new and existing. In this way, DC ECO GRID creates a link between a more eco-friendly metals industry and new green energy supply systems.

With the rise of renewable energy technologies that produce power in the form of direct current (DC) – which can be used directly by industrial machines – plant-internal DC grids can play a key role in decarbonizing industrial production. This is especially true for energy-intensive steel plants.

In an energy industry that has long relied on large coal and nuclear power plants as electricity suppliers, public power grids are mainly AC grids. For consumers in industrial grids, the alternating current must first be converted into direct current, a process that offers just few opportunities for energy recovery. That is why plant-internal DC microgrids are met with great interest in the steel industry.

An energy-efficient plant infrastructure from a single source

The expansion of renewable energies, however, requires greater flexibility of the power supply system. The need for constant balancing of supply and demand for a secure power supply leads to greater use of electricity storage along with an increasing share of wind and solar energy. Both, short-term storage and long-term storage are absolutely essential for intelligent load management, e.g. to be able to handle peak loads. In particular, where the load clearly exceeds the infeed from renewable energies or, vice versa, the infeed from renewable energies temporarily exceeds the load, shifts as well as switch-overs of non-critical power applications must be managed.

SMS group's DC ECO GRID is able to connect all metallurgical plant units to an economical power grid. It comprises a central connection to the public AC grid, to the available renewable energy sources, such as solar or wind energy, as well as energy storage units such as battery storage systems.

"As a systems supplier and system integrator of large-scale steel production plants, we combine all electrical consumers and power producers," says Gerald Mayr, Executive Vice President

Electrics/Automation. "Our DC ECO GRID connects them to hybrid power distribution grids, AC & DC, thus improving the plant's energy efficiency. It is the link between a green metals industry and new green energy supply systems. Combined with energy management consulting, business case definition and concept development as well as solution design and system integration, we provide an integrated solution – from a single source."

For the customers, SMS group's modern DC ECO GRID solution offers cost advantages, ensures constant reliability of all production facilities and enables future-oriented extensions for green steel production.

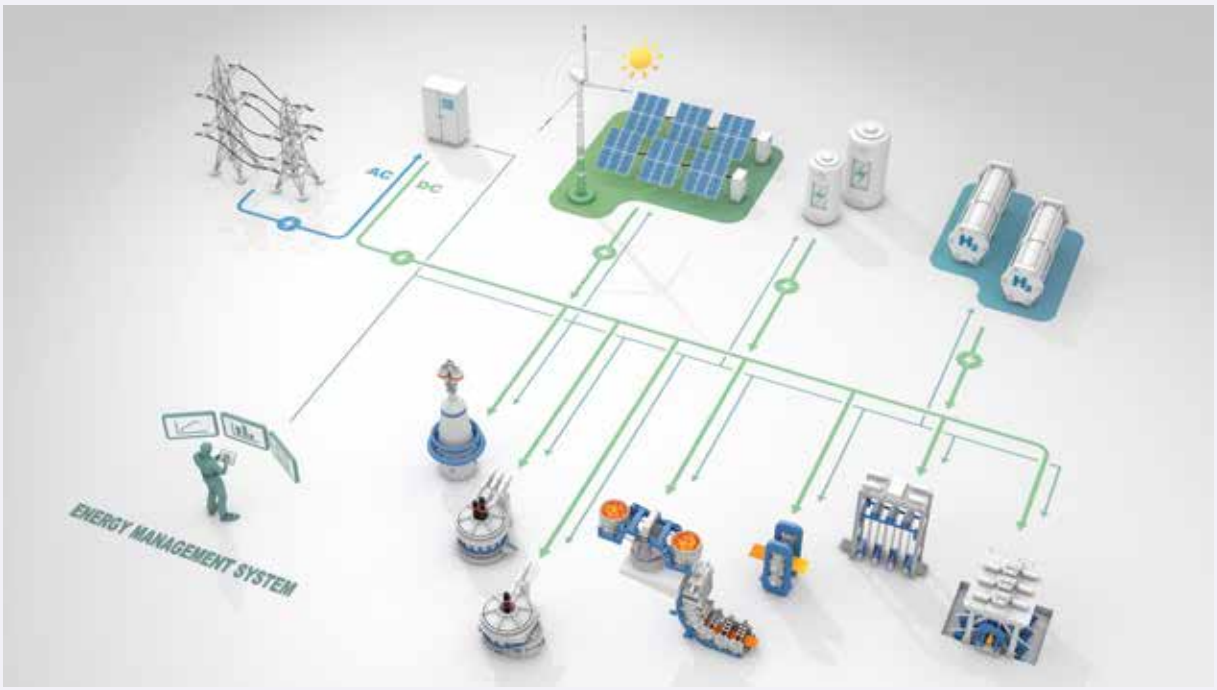
Cost advantages

In the future, DC ECO GRID will connect large consumers in modern steelmaking plants, such as electric arc furnaces, rolling mills and strip processing lines, to the public power grid. With a plant-internal DC grid, production units can be connected to new hydrogen electrolysis units, powerful battery storage units and renewable energies. The connection is made via state-of-the-art power electronic rectifiers and inverters, which are connected to the DC grid. For example, frequency converters no longer require the rectifier components needed in an AC grid. In this way, savings are obtained as the infeed units can be omitted in the case of direct infeed from a DC grid. This also reduces the cost of cabling.

Reliability of production facilities

The reliability of the entire production line or individual production areas can be increased by integrating battery storage units and local power generation plants into the production facilities' power supply. In this way, production downtimes due to disturbances in the power grid are pre-

Green energy supply for plants in the metals industry with DC ECO GRID from SMS group



vented. Supported by intelligent energy management systems, the production process can be optimized in terms of energy consumption.

The path to green steel production

Today, conventional metallurgical plants are usually supplied with different voltage levels via three-phase AC grids. Electrical losses due to the apparent power and high investments in flicker compensation and adaptation of the power factor are accompanied by a large space requirement for such plants. The owners of such plants rarely use renewable energies.

Since fewer rectifier components are required, DC ECO GRID allows for large energy savings. Unlike AC grids, in which the machine braking energy is often dissipated in the form of heat and lost, DC grids allow for the energy to be restored and used elsewhere. With renewable energy sources and energy storage units connected directly to the DC ECO GRID, the plant is not only more flexible and independent of overall variations or power outages that might occur in the public grid, but also relies on CO_2-neutral resources for green steel production.

Know-how for green power supply

As a systems integrator and supplier of large-scale metallurgical plants, SMS group can help to combine all consumers and power generators in order to operate distribution grids as DC ECO GRID or as a hybrid mix. These microgrids can be completely or partly converted into DC grids both for new plants and for modernization projects.

Components for connecting to the DC ECO GRID are designed and manufactured within the SMS group companies:

- **X-Pact® AURA for EAF** – The Advanced Unit Rectifier Assembly is designed to achieve efficient and stable power control to supply electric arc furnaces even in weak power grids. Compact modules of approximately 10-13 MW can be connected in parallel to achieve the desired furnace power rating.
- **X-Pact® Drives** as a standardized, modular drive solution meet the high demands of the metals industry – from steelmaking plants to rolling mills and strip processing lines. Common DC or AC bus designs cover power ranges from 0.75 kW up to 5,300 kW. With the X-Pact® Drive system, also DC/DC couplings can be implemented.
- **X-Pact® High Current** switch-mode rectifiers ensure a dynamic DC power supply up to 3,000 kW or 150,000 A for electrolytic strip processing, and enhance the plant performance in terms of residual ripple, power factor, control speed and control accuracy. X-Pact® High Current units can be retrofitted to existing lines, thus contributing to the reduction of the ecological impact of existing plants.
- **Torque Drive:** SMS group's innovative direct drive system allows the machine to achieve an overall efficiency of 98 percent. This energy-efficient, low-noise and extremely maintenance-friendly drive was specially developed for use in machine and plant engineering. In addition to the ecological aspect, the drive concept is characterized by its particularly high efficiency, which is achieved by the elimination of loss-inducing conversion stages and by being able to omit auxiliary units. Furthermore, the physical-electrical principle of a permanent magnet synchronous motor is much more efficient than that of an asynchronous motor. Integrated components of the direct drive in the mechanical application ensure maximum process-oriented drive power and require low maintenance.
- **EloMat™ converters for induction heating** from SMS ELOTHERM are used in numerous applications such as hardening, tempering, annealing, heating, welding and melting. Modern IGBTs and MOSFETs cover a wide range of frequencies and power levels. The power spectrum ranges from 120 to 4,500

kW per unit, with frequencies ranging from 1 to 600 kHz, thus creating the basis for efficient induction.

- **X-Pact® Battery Storage** from LUX Automation can be produced using either new batteries or second-life batteries. With a modular capacity ranging from kW to MW, energy can be stored in the short and medium term. In addition, to ensure power grid stability, a "very fast" power reserve is available, which can be started up within milliseconds and provides for peak shaving.

- **Power-to-H2 electrolysis technology** from Sunfire, SMS group's strategic cooperation partner, ensures hydrogen production with renewable energy, substitutes fossil fuels and leads to a significant reduction of CO_2 emissions across all sectors. Scalable 10 MW modules enable effective adaptation to large electrolysis capacities. The DC ECO GRID bus connects the Sunfire hydrogen electrolysis modules.

- An intelligent and modular **energy management system** integrates these resources to form a hybrid grid. SMS digital and Vetta jointly develop digital solutions for efficient energy management. The **Viridis Energy & Sustainability Platform** is a comprehensive management solution for steel plant operations. Viridis not only optimizes throughput and quality, but also energy costs and raw material use, and even reduces the emission of carbon dioxide, greenhouse gas and the waste volume. The system manages power contracts, simulates cash flows from production plants and optimizes contract execution to reduce energy and resource unit costs.

Conclusion: Major advantages for plant owners

The combination of power electronic units leads to higher energy and resource efficiency as well as improved grid stability in the entirety of metallurgical plants connected to the DC ECO GRID bus technology. Energy efficiency is improved by reduced conversion and transport losses, energy recovery, direct use of renewable energy sources and the handling of load peaks by means of storage systems. The installation of such system components requires less copper for cables and bus bars. Lower equipment costs and less space requirements result in better resource efficiency, as, among other things, additional investments for adaptation of the power factor and flicker compensation are not required. The connection of new plants to existing weak grids is supported by the DC technology with the possibility of integrating battery storage and energy recovery systems to prevent production downtimes due to disturbances in the power grid. An intelligent energy management system controls the energy flows and thus helps to optimize energy procurement costs. ◆

"SMS group is the trailblazer for Green Metals. We have made it our mission to achieve future-oriented green steel production and processing. With the numerous advantages of our DC ECO GRID, we motivate a change in systems and a shift of awareness in the energy supply of metallurgical plants."

Gerald Mayr, Executive Vice President Electrics/Automation, SMS group

Alexander Feldermann
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Your partner in the circular economy

When it comes to a sustainable, carbon-neutral metals industry, the circular economy plays a central role. SMS group is shaping the transformation of the metals industry into a circular economy.

We as a society urgently need to be more resource-efficient in the way we produce and consume goods. This is the only means of securing the material and ecological foundation on which are lives are based and ensuring a good quality of life for the generations of today and tomorrow.

The circular economy (CE) is one model that aims to avoid waste and enable the continuous re-use of existing resources. The main objective is to direct end-of-life materials and products into a closed loop in order to minimize the use of resources and energy and the amount of waste, pollution, and carbon emissions.

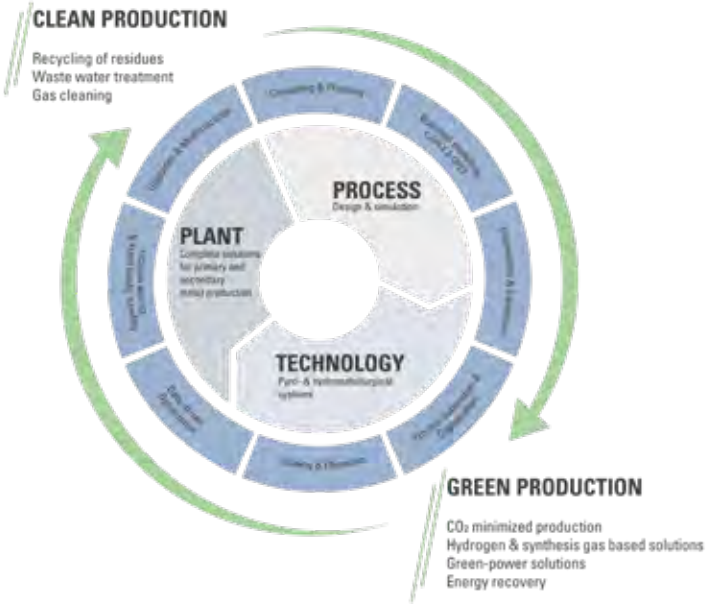
Metals and their significance for the circular economy

Metals are known for being easy to recycle. That is why they have been collected and re-utilized – wherever this made good economic sense – from the very first time they were put to use. In view of the current global developments in communications, electrification, digitalization, and the rapid transition to green energy sources, the demand for metals has continued to rise sharply and new solutions for manufacturing are now needed, because metals, like all resources, are limited.

Non-ferrous metals, in particular, are essential and can be found in all the items we use in our daily lives – for example smartphones, tablet computers, televisions, or electric vehicles. In fact, the electronic components in these products nowadays can contain more than 70 elements, mostly metals. From an ecological and economic point of view, it is imperative that we recover a portion of the non-ferrous metals through recycling.

Unique product portfolio

SMS group utilizes its wide range of technologies to shape metalmaking processes around the world. Alongside the classic, ore-based integrated solutions, the focus today is on recycling techniques for scrap, metal-bearing residual materials, and minerals. In addition, SMS group develops processes for producing alternative fuels and reducing agents that are indispensable for the climate-neutral metal production of the future.



All solutions from a single source

A great deal of effort is required from us all to meet the challenges posed by the circular economy. Over its 150-year history, SMS group has offered customers high-quality, largely linear solutions. Now, customers are increasingly asking for circular solutions that are clean, efficient, and profitable.

The path to climate-neutral circular solutions in metal production is extremely complex. The process, technology, plant design and implementation as well as the electrical and automation systems must be interconnected in order to enable plant engineering that is socially compatible and environmentally sound.

Process know-how is both the essential foundation and the heart of the circular economy.

The transformation of technology into a circular economy requires a solid base of existing technologies and references. These references can be adapted to the new CE requirements, such as improved process efficiency, reduced energy consumption, and the demand to feed material flows back into specific units.

A fully integrated plant is ultimately a combination of various different technologies. Here too, SMS group has an impressive track record when it comes to the supply of complete industrial plants. The SMS group approach combines electrical and automation systems with in-house digital solutions and services.

Built on a foundation of process expertise

What does the circular economy mean for the metal production process? Going forward, all by-products created during the production process must be considered within the context of the circular economy. This means that dusts, slags, residues, and flue dusts must be integrated into the production lines and processes, and landfilling must be avoided. In addition, the transport of material that is either contaminated or declared as waste will be possible only to a limited extent in future, especially over longer distances and across borders.

The integration of these additional material flows while maintaining high quality standards for the product is making the field of metallurgy even more complex. Other requirements for energy-optimized and CO_2-neutral solutions further complicate the metallurgical picture. Because of the circular economy, metallurgical expertise has again become the focal point for all metal manufacturers and plant builders.

Process simulation for complex solutions

SMS group's unique pool of expertise comprises teams of specialists working in the fields of coke plants, blast furnaces, steelmaking, ferroalloys, innovation, non-ferrous metals, digitalization, and electrical and automation systems. The internal simulation platform, which is based on HSC, FactSage and software developed in-house, enables the creation of digital twins for complete processes/plants. Here, additional CFD models for optimizing processes can be integrated – which is a world first.

Standout features of the simulation

The BlueControl calculation tool allows the static and dynamic simulation and calculation of the pyrometallurgical and hydrometallurgical processes for iron and steel, ferroalloys, and non-ferrous metals. As a result, the dimensioning of units/furnaces as well as of complete plants and combinations of plants can be precisely determined. In addition, it is possible to make realistic calculations of the carbon footprint and other emissions. These findings form the basis for official permits, investment decisions, and general feasibility studies. Such a precise process calculation and simulation is indispensable for plant automation systems (level 2 to level 4 systems).

THE BLUECONTROL APP

BlueControl is the world's only calculation tool for non-ferrous metal units and offers dynamic simulations of metallurgical processes. BlueControl takes more than 70 elements into consideration in the energy and mass balances.

The path to climate-neutral metal production

Carbon-neutral metal production will be one of the industry's biggest challenges in the decades to come. The first step is to precisely define the carbon footprint of new and current plants. SMS group has a wide range of smelting and refining facilities in its product portfolio as well as a number of energy recovery systems that can be supplemented by hydrogen/syngas-based burner and refinery systems. This plays an important role in the overall evaluation and optimization of the CE compatibility of a metal production plant.

Of particular importance is the assessment of a plant's current and future CO_2 footprint. Many plants can be used as a basis here, so that if most or even 100 percent of the electrical energy is based on green energy, for example, an electric smelter may well be the preferred choice instead of fuel-fired furnaces.

SMS group offers precise, detailed advice for defining the carbon footprint of an existing or planned plant. CO_2-reduction solutions can then be jointly developed. Various approaches to this can be taken. Digital solutions are useful for determining the current state and enabling further measures to reduce CO_2 emissions using software tools. Significant CO_2 savings can be achieved, particularly in respect of energy and fuel/gas efficiency. Looking ahead, electrification is also set to play a special role when electricity can be generated in a carbon-neutral way. Compared to the production of metals by primary routes, metal recycling can also deliver a significant reduction in the carbon footprint.

Unique recycling competence

Even after their end-of-life, products made of metals and their alloys are valuable, while usable deposits are limited. For this reason, they have to be made from secondary/residual materials without affecting their properties.

Besides financial incentives, the ecological and social aspects are crucial. Compared to the use of ore-based raw materials, the recycling of metals enables natural resources to be conserved while at the same time lowering energy consumption levels. With recycling, less CO_2 and other harmful gases are released and less energy is needed. Metals and other valuable materials can be recovered from metal and electronic scrap, batteries, catalysts, slags etc. SMS group

OVER 4,000 TYPES OF METAL-BEARING MATERIALS

The recycling processes are utilized to make high-quality products from metal-bearing materials.

Electronic scrap

- Wide range of WEEE grades as input (low – high-quality grades)
- High recovery rates and pure products

Batteries

- Wide range of batteries (based on Li-Ion, Pb, and NiCd)
- High recovery rates and pure products

Catalysts, fuel cells

- Recycling of automotive and industrial catalysts
- High recovery rates and pure products
- Catalysts from the chemical and food industries

Scrap

- Refining furnaces melt and refine scrap to produce high-quality Cu/FRHC
- Production of Cu foil and FRHC ingots/granules

Slags and landfills

- Process for the recovery of metals from slags and landfill sites
- Conditioning of contaminated slag to create high-quality products

has developed pyrometallurgical and hydrometallurgical recycling processes that offer economically and ecologically balanced solutions.

It is estimated that more than 4,000 different types of metal-bearing materials, including e-scrap/WEEE, EOL batteries, production and metal scrap, metal fine, autocats, slags, dusts, combustion residues, and minerals, are available. Furthermore, some of these materials are currently defined as waste in one sector, yet they may be a valuable material source for another metal-producing industry. Dust from the steel industry, for instance, is an attractive raw material for lead/zinc producers.

The recycling processes

SMS group's goal is to manufacture high-quality products from metal-bearing materials in an environmentally friendly manner within the circular economy paradigm.

The recycling and recovery of metallic materials used to produce pure components is costly and requires several process stages. This becomes obvious if you try to imagine "recycling" a cup of coffee containing milk and sugar into the separate ingredients comprising coffee, milk, sugar, and water. It is quite a challenge and requires several steps as well as additional energy. And even if you did manage to do this, it would no doubt taste different. Metal-bearing waste is far more complex, especially when recycling electronic components such as smartphones or batteries. ◆

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REFERENCE

MULTIMETAL RECYCLING PLANT

Aurubis and SMS cooperate in the construction of a multimetal recycling plant in Georgia, U.S.A.

100

jobs will be created in the new recycling plant built by Aurubis. The plant will process about 90,000 tons of complex recycling materials annually.

Aurubis AG and SMS group have signed a contract for the construction of a multimetal recycling plant in the United States. The new Aurubis recycling plant will start in mid-2022 in Augusta, Richmond County, in the state of Georgia. Upon commissioning, which is scheduled for the first half of 2024, the plant will process about 90,000 tons of complex recycling materials annually. Aurubis is creating over 100 jobs in the region.

With the agreement, the two companies agree to work closely together on the greenfield project Aurubis Richmond, with SMS group planning the facility concept, delivering it, and implementing it on site. Moreover, SMS group is delivering the technology for the top-blown rotary converter (TBRC), a state-of-the-art piece of equipment for processing complex recycling materials to recover copper, nickel, tin, zinc, precious metals, and platinum group metals. The scope of delivery also includes the sampling and off-gas cleaning facilities. Both partners are contributing their expertise to the construction of the modern recycling site to optimally fulfill the requirements of a sustainable circular economy.

Aurubis and SMS group also signed a cooperation agreement. With this long-term collaboration, both partners intend to be able to quickly implement the planning, construction, and development of additional modular recycling facilities in Europe and North America in the case of a positive investment decision from Aurubis. The construction of Aurubis Richmond is therefore the starting point of this partnership in the multimetal recycling sector – and the project's success points the way ahead for both partners from a strategic perspective.

Accelerated decarbonization

"With the investment in Aurubis Richmond, we reinforce our ambitions to continue expanding the recycling of complex, valuable metal-bearing materials and returning them to the material cycle," emphasizes Hans Rosenstock, Managing Director of Aurubis Richmond. "SMS group is an extremely competent partner for the setup of the site, a partner that will support us in implementing custom-fit solutions for ecologically sustainable business activity and accelerated decarbonization."

"We're pleased to bring the state-of-the-art recycling plant in Richmond to life, together with Aurubis. In addition to technological expertise, we're united as partners by our strategic orientation toward continued growth in the circular economy and the recycling business, as well as contributing to climate protection with new technologies. Furthermore, our intelligent and efficient digital concepts enable us to optimize the production processes. This modular facility sets new international benchmarks in recycling electronic scrap and is planned for additional sites as well," says Michael Rzepczyk, Member of the Managing Board of SMS group.

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REFERENCE

PEIRCE-SMITH CONVERTER FOR BATTERIES

Nickel matte for battery production.

In December 2021, Korean SNNC Co., Ltd. awarded SMS group an order to supply a Peirce-Smith converter for the production of nickel matte to be used as raw material in the newly installed Ni-battery production line. The new plant in Gwangyang, Korea, will go on stream this year.

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A Peirce-Smith converter is a special unit that converts copper matte into blister copper.

REFERENCE

CIRCULAR ECONOMY FOR COPPER

AMES orders secondary copper smelter from SMS group.

SMS group is supplying a secondary copper smelter to Ames Copper Group, a joint venture between Prime Materials Recovery Inc. and Cunext Group, for its North Carolina, U.S.A., location. It will be designed for a capacity of 50,000 tons of copper anodes annually.

The new plant will be the first secondary copper recycling facility in the United States to produce copper anodes from copper scrap and copper fines.

It will include a tilting refining furnace, anode casting wheel, gas cleaning system, and electric and automation systems. In addition to the equipment supply, SMS will provide technical assistance for the installation and start-up, and be responsible for the layout of the core equipment. The plant will be prepared for a future upgrade with additional digitalization features.

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50,000

tons of copper anodes will be the plant's annual capacity.

Dr.-Ing. E. h. Heinrich Weiss, Chairman of the Shareholders' Committee, opened the event with a personal address.

REFERENCE

BATTERY RECYCLING

The first Primobius-built battery recycling plant was opened with an official ceremony.

PrIn March, Primobius took another important step with an official ceremony in which the go-ahead was given for the start of commercial battery recycling in Hilchenbach planned for May this year. The joint venture partners, Neometals and SMS group had invited guests from politics, business and the media to the grand opening.

Dr.-Ing. E. h. Heinrich Weiss, Chairman of the Shareholders' Committee, opened the event with a personal address. He particularly highlighted Hilchenbach as the birthplace of today's SMS group as well as the place of origin of many outstanding technologies.

In a video message, Prof. Dr. Andreas Pinkwart, Minister of Economics, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia (NRW), congratulated both joint venture partners on the success so far achieved and particularly on choosing the North Rhine-Westphalian town of Hilchenbach as the location of the new recycling plant.

The recycling system installed in Hilchenbach is the first of its kind built by Primobius. It enables the company to give live demonstrations of the innovative two-stage recycling process and its benefits. So far, the system has been used to prepare feasibility data and assist with process optimization. The plant can process up to 10 tons of feedstock per day. Representatives of the joint venture partner Neometals covered the long way from Perth, Australia, to attend the ceremony. In his speech, Neometals CEO Christopher Reed outlined the history of the fruitful partnership between SMS group and Neometals and called the opening of the first commercial plant just the start of a long journey together.

It was a privilege to welcome another Australian guest and speaker in Hilchenbach. The Australian Ambassador to Germany H.E. Philip Green pointed out the importance of recycling and the circular economy and was very happy about this positive example of German-Australian relations.

Primobius General Managers Horst Krenn and Michael Tamlin jointly start the plant with the symbolic push of the button.

It was a great privilege to welcome the Australian Ambassador to Germany in Hilchenbach.

Following the greetings, Primobius Managing Directors Horst Krenn (SMS group Process Technologies) and Michael Tamlin (Neometals Ltd.) jointly pressed the button to start the machines. After a short demonstration of the shredder, the 60 invited guests were taken on a tour of the plant. ◆

Scan this QR code to watch **a video of the opening ceremony**.

Further information
www.primobius.com

Hilchenbach to become location for LIBs recycling services

To achieve the set sustainability targets and enable the re-use of valuable raw materials, producers and users of lithium-ion batteries - electric vehicle manufacturers, for example - are required by law to take back spent battery cells and make sure that their end-of-life LIBs are recycled in a sustainable way, either by themselves or by a third-party recycling services provider. As a result, entirely new industrial sectors and services are likely to evolve around the recycling of lithium-ion batteries.

Primobius will use the frontend part of the recycling system in Hilchenbach to offer disposal services. Customers can use this service to dispose of their lithium-ion batteries of types NMC (lithium nickel manganese cobalt oxides), NCA (lithium nickel cobalt aluminum oxides) or LCO (lithium cobalt oxide) from consumer electronics or electric vehicles in a sustainable, eco-friendly way.

The mechanical shredding and beneficiation processes produce what is called the Black Mass in addition to a mixed material fraction consisting of copper, aluminum and plastic parts from the batteries. Following the principles of a circular economy, these materials are further processed into product ready to be returned to the market.

Centrally located in Europe

The location of the demonstration facility was chosen deliberately: „Germany has the advantage of having a good infrastructure and being centrally located in Europe, which really suits us from a logistical perspective," says Prof. Dr. Hans Ferkel, Chief Technology Officer and Member of the Managing Board of SMS group GmbH. "We also anticipate a sharp rise in demand for recycling solutions here in Germany as the electromobility sector continues to boom and we initially have a head start with production scrap, only then to be deluged with vast quantities of spent batteries." ◆

Scan this QR code to watch **a video of the "Start of recycling in Hilchenbach".**

Further information
www.primobius.com

Primobius will offer disposal services from Hilchenbach.

In the shredding and beneficiation stage, a mixed material fraction is produced.

The final products can later be returned to the market.

REFERENCE

TECHNOLOGY PARTNERSHIP

Mercedes-Benz expands its global battery recycling strategy and intends to build its own battery recycling factory with Primobius as its main technology partner.

In Germany and Europe, electromobility is a mega trend with great growth potential. Consequently, a significant expansion of production capacities for lithium-ion battery cells can be anticipated. However, this may be hampered by a bottleneck of resources: The raw materials to produce the cells in the quantities needed are not readily available. Sourcing these materials in Germany generally involves expenses for - and CO_2 loads arising during - their transport and extraction. Therefore, recycling plays a vital role in this context: On the one hand, it improves the CO_2 balance of lithium-ion batteries, and, on the other hand, it provides battery producers with the essential raw materials lithium, nickel and cobalt.

Maximizing the recycling rate together

With a view to the future return of lithium-ion battery systems, Mercedes-Benz is expanding its global battery recycling strategy and intends to build its own battery recycling factory in Kuppenheim, Germany. To this end, the company has founded LICULAR GmbH as a wholly-owned subsidiary and is cooperating with Primobius as the main technology partner. The common goal of the partners is to maximize the recycling rate, reduce resource consumption and create a circular and sustainable raw materials supply chain.

The planned CO_2-neutral facility is intended to cover an annual capacity of 2,500 tons. The recovered materials will be fed back into the recycling loop.

Horst Krenn, Managing Director of Primobius, says: "With electromobility playing an increasingly important role, we anticipate a growing demand for battery recycling and see the need for Europe to create comprehensive and efficient recycling capacity right now. We are proud to be one of the first to realize a resource-efficient recycling technology in the heart of Europe. The joint project with Mercedes-Benz shows that our two-stage recycling process, and particularly the high recovery rates with hydrometallurgy, already meets the industry's needs today." ◆

Highly pure substances can be fed straight back into the supply chain for battery production.

ADVANCED RECYCLING TECHNOLOGY

Primobius, a joint venture between SMS group and Australian Neometals Ltd., is to commercialize advanced recycling technology, offering a sustainable method for recovering valuable lithium, nickel, cobalt and other materials from expended and scrap electric vehicles and consumer electronics LIBs. The joint venture uses a two-stage recycling technology, combining mechanical processing and hydrometallurgical treatments, to make the recycling of batteries more efficient and future-proof. The recovered and refined materials can be returned straight into the supply chain of battery production.

Further information
www.primobius.com

2,500

tons is the annual capacity to be covered by the planned facility.

Scan this QR code to watch **a video featuring the technology partnership.**

A TURNKEY SUCCESS

INDONESIA

On the island of Java, Indonesian steel producer PT. Krakatau Steel has put on stream one of the most advanced hot strip mills worldwide. The new hot strip mill 2 was built on a turnkey basis by a consortium of SMS group and PT Krakatau Engineering. The entire project was managed and implemented safely and reliably by SMS as the consortium leader and contact partner.

KRAKATAU STEEL

“Our experience in this project was really great. In my view, SMS is a very good partner. I can absolutely recommend SMS as the leading partner in the world of metals.”

Silmy Karim, CEO PTKS

The walking beam furnace supplied by SMS group is energy-efficient and precisely heats the slab to the required rolling temperature.

With its turnkey hot rolling mill 2, Krakatau Steel is able to manufacture a wide range of products. In particular, this includes thin and high-strength strip as well as sophisticated tube and automotive grades. SMS group's intelligent plant concept already takes into account efficient future expansion. Two additional walking beam furnaces, an exit-side edger at the roughing stand, a seventh mill stand in the finishing line and two more coilers permit the mill's capacity to be increased from a current output of 1.5 million tons to 4 million tons per year. The product range can be flexibly expanded, too.

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For more information please refer to our online magazine.

The six-stand finishing mill distinguishes by maximum precision, productivity and availability. Due to the perfect interaction of SMS group's technological systems, the strip produced is of consistently outstanding quality within closest tolerances. To ensure this result, the mill is equipped with hydraulic roll gap adjustment, work roll bending, CVC® plus system for work roll shifting, roll gap lubrication, interstand cooling and interstand descaling as well as extremely durable X-Roll® oil film bearings.

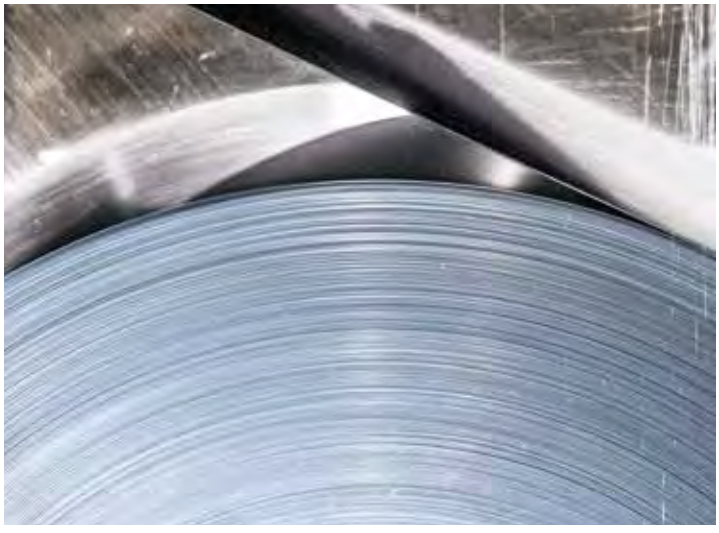
The modern roughing stand comprises robust side guides, an edger with a rolling force of 6,700 kilonewtons and a four-high stand which has a rolling force of 46,000 kilonewtons. Thanks to the camber-free rolling technology consisting of hydraulic side guides, hydraulic adjustment system in the roughing stand and the necessary automation models, flat transfer bars with perfect geometries are produced.

On the road to X-Pact® Lights-Out: For the first time in a state-of-the-art hot strip mill, a central control station concept was implemented, meaning that all plant areas can be operated and controlled from just one control station. SMS group supplied all X-Pact® electrical and automation systems which are the central interface for all level 1 and level 2 automation systems and process models. High-tech sensors are integrated throughout the plant and transmit their data to the technological control systems in real time to ensure optimal rolling settings.

“It was the team spirit across departments, business units, locations and nationalities, fed by the personal commitment and drive of every single team member that took the project at PTKS to a succesful conclusion, although the implementation thereof had been impaired by adverse and unforeseen general conditions, in particular the global COVID-19 pandemic.”

Rainer Hoppe, Implementation, SMS group

The innovative HI_{BOX}® thermal hoods patented by SMS group optimize the temperature homogeneity across the entire length and width of the transfer bar and significantly reduce energy consumption and operating costs.



The plant produces hot strips between 600 and 1,650 millimeters wide and 1.4 to 16 millimeters thick. The coiler with step control system winds the hot strip into straight-edged coils using side guides and pinch rolls.

Horizontal caster for extrusion billets made of copper alloys.

Up to **150,000 tons production capacity** per year

One of the world's largest continuous casters

ITALY

HME (Hailiang Metal Europe) has placed an order for a four-strand, fully continuous horizontal caster for brass billets.

The new caster, one of the largest in the world for copper alloys, will replace an existing semi-continuous vertical caster at the company's Serravalle location in Italy. With this new facility, the Italian producer of brass profiles intends to achieve consistent product quality and boost its productivity significantly.

The new four-strand caster will produce brass extrusion billets with diameters between 245 and 400 millimeters for the subsequent production of profiles using extrusion presses.

"Our overall package, from plant engineering to automation through to digitalization, was what convinced HME. HME can count on the reliability, durability and high design quality of our equipment," says Dr. Thomas Winterfeldt, Executive Vice President Forging Plants.

The scope of supply includes a pressure-controlled casting furnace with a capacity of approx. 35 tons, high-performance molds for efficient strand solidification, a withdrawal device with highly advanced Softcast drawing cycle, a flying saw, an exit roller table with separating device, an automatic cooling water control system for constant process conditions, and a hydraulic unit.

The basic digitalization package consisting of SMS-Metrics (process data acquisition) and Smart Alarm (plant fault monitoring) will assist the plant operator in increasing process transparency and plant availability and finally help to reduce maintenance costs to a minimum. Smart Alarm offers an enhanced overview and better control of error messages and simplifies the process of analyzing system notifications. For greater process transparency, the process and plant parameters can be visualized and evaluated using SMS-Metrics.

The new continuous caster is scheduled to go on stream in the second half of 2022. ◆

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Green casthouse technology

ICELAND

Following the trend towards aluminium plants with the lowest possible carbon footprint, Nordural, domiciled in Iceland and part of Century Aluminium, has ordered Hertwich Engineering to supply a complete aluminium billet casthouse with zero greenhouse-gas emissions.

Hertwich Engineering will deliver two electrically heated holding casting furnaces, a vertical casting machine and an electrically heated continuous homogenizing plant for a yearly production of 120,000 metric tons of aluminium billets. As a complete plant integrator, Hertwich will also supply the automation of the casthouse. The homogenizing plant includes a Hertwich ultrasonic inspection station with billet saw plant including band strapping system. Through its strategic position between North America and Europe and CO_2-neutral power generation in Iceland, Nordural can offer their green aluminium Natur-AlTM with reduced shipment times.

"We are pleased and honoured to be chosen by Nordural for supplying the complete casthouse, but even more we a proud to be an active partner in achieving lowest CO_2-emissions per ton of aluminium billets and as such helping to achieve the global climate change goals," stated Gerold Keune, Managing Director of Hertwich Engineering.

Nordural operates an aluminium plant at Grundartangi, Iceland, with a capacity of approx. 320,000 tons per year and is part of Century Aluminium.

Hertwich Engineering, Austria, designs and supplies complete casthouse technology as well as single equipment to the aluminium industry and is part of SMS group, Germany, one of the biggest family-owned engineering companies in Europe. ◆

Further information
www.hertwich.com

Contract signing ceremony: Gunnar Guðlaugsson (left), Executive Vice President, Global Operations and Managing Director of Nordural, and Gerold Keune, Managing Director of Hertwich Engineering.

iForge® Traceability

SMART FOOTPRINT

Measure, record, and verify the carbon footprint of every forging with a precise CO_2 value.

The dot peen marking code survives all process steps.

Left: Forged part with data matrix code,
middle: after sand-blasting,
right: machined part with laser code.

Marking station:
a robust data matrix code is applied onto every forged part by dot peen marking.

- **SMS group has created a unique solution for the digitalized and smart tracking of every single forged part to the long-term benefit of forging shops and their customers.**
- **Instead of major recall campaigns, it is now possible to narrow down a quality issue to just a few individual forgings and pinpoint the cause.**
- **Identifying new optimization potential along the entire process and value chain.**

Traceability module added to the range of integrated iForge® solutions

iForge® is SMS group's cutting-edge solution that enables plant owners to take process performance, product quality, ecologization and cost optimization to a completely new level. It is the link that connects measuring technology, programming, engineering as well as process and control technology to optimize and enable better control of forging processes.

Equipped with state-of-the-art sensor technology and high-resolution cameras, machinery will be capable of making intelligent, independent decisions in the future based on relevant data and evaluations. Axel Roßbach, Forging Technology Manager at SMS group, says: "iForge® is the future of closed-die forging."

The iForge® module to detect cracks and predict wear is a good example to show what this looks like in real-world applications. The crack detection function clearly identifies a crack that is starting to develop inside the die before it can affect the quality of parts or the process. The wear prediction capability provides similar advantages.

With iForge® Traceability, forging shops now have another powerful tool at their disposal. For each forging, the actual process data are stored in a data record that is kept for the product throughout the whole process.

Innovation lies in combination

Previous tracking methods failed due to the ambient conditions of the forging process. Laser codes were not able to withstand the heat and the mechanical stresses. Axel Roßbach says: "Our patent-pending process combines two marking techniques – dot peen marking and laser marking. In the forging process, we apply a code to the forging with a dot peen marking machine. This code lasts through all subsequent processing steps. Only when producing final workpiece surface, the dot peen marking code is removed by machining and a laser code is applied immediately thereafter."

Automotive manufacturers demand a precise CO_2 value for forged components

iForge® Traceability is opening up entirely new perspectives to forging companies. The best example here is the ability to obtain a CO_2 value for every forged part. Automotive manufacturers have to calculate the carbon footprint of their production and their suppliers. At the same time, OEMs demand that sub-suppliers provide verifiable emission values for their components.

Implementing iForge® Traceability, forging companies not only comply with a basic requirement stipulated by automotive manufacturers but also benefit from additional opportunities the solution offers. "The more important aspect is that the companies will able to identify high-carbon components," explains Martin Scholles, Technical Sales Closed-Die Forging at SMS group.

Cost savings and significant minimization of recalls

Quality issues with a forged product can have a wide variety of reasons. Typical forging defects such as underfills, overlaps, or notches are very difficult to capture and measure. Thanks to the high level of quality assurance in forging shops, such defects are extremely rare. However, if they do occur, the economic damage will be considerable.

Martin Scholles: "With iForge® Traceability, forging companies can now trace the defect to see if it's a one-off error or a systemic fault. In most cases, the defect can be narrowed down to just a few products and the damage caused

is limited. Automotive manufacturers will benefit, too, as they only have to recall the vehicles with identified parts. The same goes for mass-produced goods used in the aviation industry. Here, the part history can be read and traced directly on the aircraft by means of laser code."

Where quality assurance and process optimization start

The built-in sensors continuously gather process data, store them in an endless database, and assign them, right at the start, to a single part number, which is applied to the workpiece immediately after forging.

SMS-Metrics is a suitable and effective tool for collecting, storing and evaluating machine data in real time and also the data of the iForge® Traceability module. Evaluations can be easily made and dynamically adapted in the browser and be retrieved from any location worldwide.

High cost efficiency

In addition to the indirect advantages described, iForge® Traceability contributes directly to improving cost efficiency. Defective components, for example, can be identified at an early stage and removed quickly, before a large portion of the added value has gone into the part. Processes can be stabilized and the overall equipment effectiveness (OEE) enhanced by making automatic corrections during the manufacturing process. In this way, safety stocks can be reduced or even completely eliminated. Supported by optical systems that perform a last check, the final inspection process, which has been very labor-intensive up to now, can be largely automated.

"With iForge® Traceability forging companies can now trace the defect to see, if it's a one-off error or a systemic fault."

Martin Scholles, Technical Sales Closed-Die Forging, SMS group

The process: The best of both worlds in one solution

In developing iForge® Traceability, the R&D experts at SMS group have combined two processes in one solution: The dot peen method for code marking on the high-stress process part and the laser method (with additional information such as customer and supplier details) on the finished part with final contour. This ensures every single workpiece has its own fully traceable data record.

Important milestone reached: SMS group presents iForge® – an innovative digital solution for closed-die forging.

The dot peen marking procedure is performed directly downstream of the forging press. Here, robots feed the workpieces to the marking station in a fully automated process. A standardized data matrix code (ECC200 per ISO/IEC 16022) is applied. The dot peen marking code is extremely resilient and fault-tolerant. Even if 25 percent of the code surface area were destroyed, it would still be possible to read it. The dot peen marking code is applied in an area that may be removed during machining.

To ensure the code information is retained right up to delivery of the component, the dot peen marking code is scanned immediately before machining and stored in the sequential data record. This unique data record also contains the information of the laser code that is created as a final label by a laser marking system.

A must-have: for retrofits and new equipment

In terms of both, equipment and control technology, the new system can be integrated into existing facilities. Klaus Merkens, Sales Manager Closed-Die and Open-Die Forging at SMS group, says: "As part of our digitalization strategy for our customers, we are already equipping all new plants with a future-oriented basic digitalization package ready for future extension. With iForge®, customers can decide what individual services and solutions they would like to implement to meet their needs."

Setting the course today for the digital world of tomorrow

iForge® Traceability is an excellent example of SMS group's digitalization strategy that offers customers an array of possibilities. Dr. Thomas Winterfeldt, Head of Forging Plants at SMS group, says: "With our subsidiary SMS digital, we have the know-how, the experts, and the research and development capacities to digitalize a host of other processes in the field of forging technology and to generate real and effective added value for plant owners. At the same time, our Technical Service team at SMS group is a lifecycle partner who not only keeps a forging shop running but also implements new solutions in existing plants and offers innovative and cost-cutting service concepts. In this way, we meet our objective of being the Leading Partner in the World of Metals in every respect – and I think that is unique in our industry." ◆

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For further information please refer to our online magazine.

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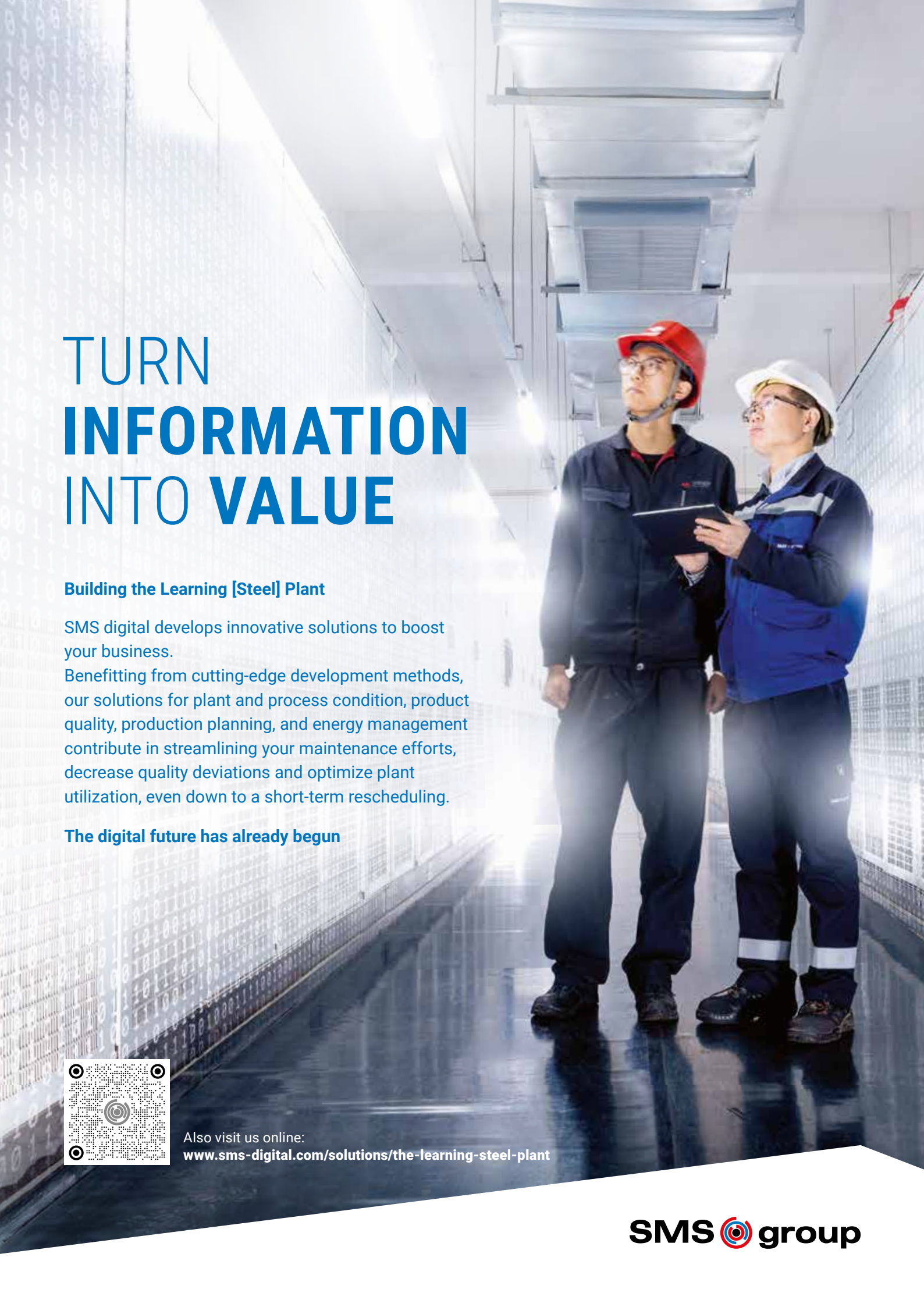

TURN **INFORMATION** INTO **VALUE**

Building the Learning [Steel] Plant

SMS digital develops innovative solutions to boost your business.
Benefitting from cutting-edge development methods, our solutions for plant and process condition, product quality, production planning, and energy management contribute in streamlining your maintenance efforts, decrease quality deviations and optimize plant utilization, even down to a short-term rescheduling.

The digital future has already begun

Also visit us online:
www.sms-digital.com/solutions/the-learning-steel-plant

SMS group