SMS insights

Stories of transformation

2023—1



turning metals green

SMS group

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#turningmetalsgreen

Our mission is to create a climate-neutral and digital metals industry

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Dear reader,

We are excited to present to you: our new magazine, SMS insights. Its first edition primarily focuses on turning metals green – a vision that drives our industry today and reflects our mission as a provider of technology and expertise for many of the world's most forward-thinking green metals projects.

We're the partners of groundbreaking endeavors like H2 Green Steel in Sweden – a pioneering sustainable steelmaking venture that will reduce CO_2 emissions by 95% compared to a traditional plant and will be powered by one of the world's largest green hydrogen plants. H2 Green Steel shows that climate-neutral steelmaking will be possible by the middle of this decade.

In Germany, we are developing one of the world's largest industrial decarbonization projects for thyssenkrupp Steel. They have awarded us the largest order in our company's history to engineer and build a hydrogen-powered direct reduction plant that will save 3.5 million tons of CO_2 emissions annually.

SMS group has been shaping the future of metals for 150 years. The time is now to evolve metals into a sustainable green future. Things are happening fast, and everybody's taking note of this transformation. We're excited about shaping this (r)evolution with our customers.

Discover what drives SMS group by exploring our diverse range of solutions in the first edition of SMS insights. For a more personal touch, we hope to see you at METEC 2023 in Düsseldorf! Because turning metals green is a joint effort – and we are the right partner for this challenge.



Burkhard Dahmen
CEO and Chairman of the
Managing Board of SMS group

FOCUS

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Cover photo:
Marcus Lindstrom

Mission possible: How SMS group turns metals green

Interview with Burkhard Dahmen, CEO of SMS group

Burkhard Dahmen



The metals industry is on the verge of a historic transformation towards decarbonization. In our interview, Burkhard Dahmen explains how SMS group has accepted this challenge, why the company is focusing on both decarbonization and recycling, and why plant engineering might be just the right place for people with a mission in sustainability.

Mr Dahmen, let's start with the news: In the past months, SMS group has signed two major green steel contracts with H2 Green Steel and thyssenkrupp Steel. What does this mean for SMS group?

Burkhard Dahmen—We're excited that the steel industry is getting very serious about decarbonization. The fact that SMS group is a major contributor to these pioneering projects shows that we are a driving force in the transformation that's now underway. The two projects, however, are very different and clearly show that there are several routes to turning metals green.

That's an interesting point. How do these projects differ, and what are the major pathways to green steel?

BD — H2 Green Steel is unique. It's a brand-new plant in Boden, in northern Sweden – a greenfield project entirely based on renewable energy. That's possible there because they have ample access to green electricity and hydrogen. That's a key factor and not available everywhere. As a matter of fact, only in a few places worldwide.

The thyssenkrupp Steel project is a very different story. Here we are doing a step-by-step conversion of a massive existing plant. We're substituting existing blast furnace infrastructure with modern direct reduction technology combined with innovative melter technology, which is a challenging undertaking and highly effective in reducing CO_2 emissions.

In other markets and geographies, for example, India and China, we'll need alternatives for direct reduction. But we have technology solutions for scenarios like that too. Using our Blue Blast Furnace and EASyMelt solutions, steelmakers can reduce CO_2 emissions in their existing plants by up to 50 %.

And for all of the above, we've been optimizing end-to-end production processes also with Industry 4.0 digitalization solutions that help save resources and improve plant profitability significantly.

If a sustainable metals industry is the goal, what is SMS group's role in that?

BD — 'Turning metals green' is our mission. We make it possible to begin with because of our unique skill sets combination in metallurgy, process know-how, and digital expertise. We develop the solutions that our customers need to do their job well – producing the metals the world needs – with minimum environmental impact. No other company can bring all of the most relevant climate-neutral processes to the table. We do that on two levels: On the decarbonization front, we can turn metals production carbon-neutral, based on green electrical power and green hydrogen. And we play a significant role in what's called circular economy – developing and optimizing technologies for bringing valuable metals back into circulation.

> "The projects for H2 Green Steel and thyssenkrupp Steel clearly show that there are several routes to turning metals green."

Recycling metals is nothing new. What does progress look like there?

BD — Everybody knows that metals are perfect for a circular economy. Take aluminum, for example: Recycling it can lower the CO_2 footprint by more than 90 % compared to primary production. Our goal is to push the boundaries of recycling rates to their technological limits – for steel, aluminum, and especially for copper and all other non-ferrous metals, which have become increasingly important.

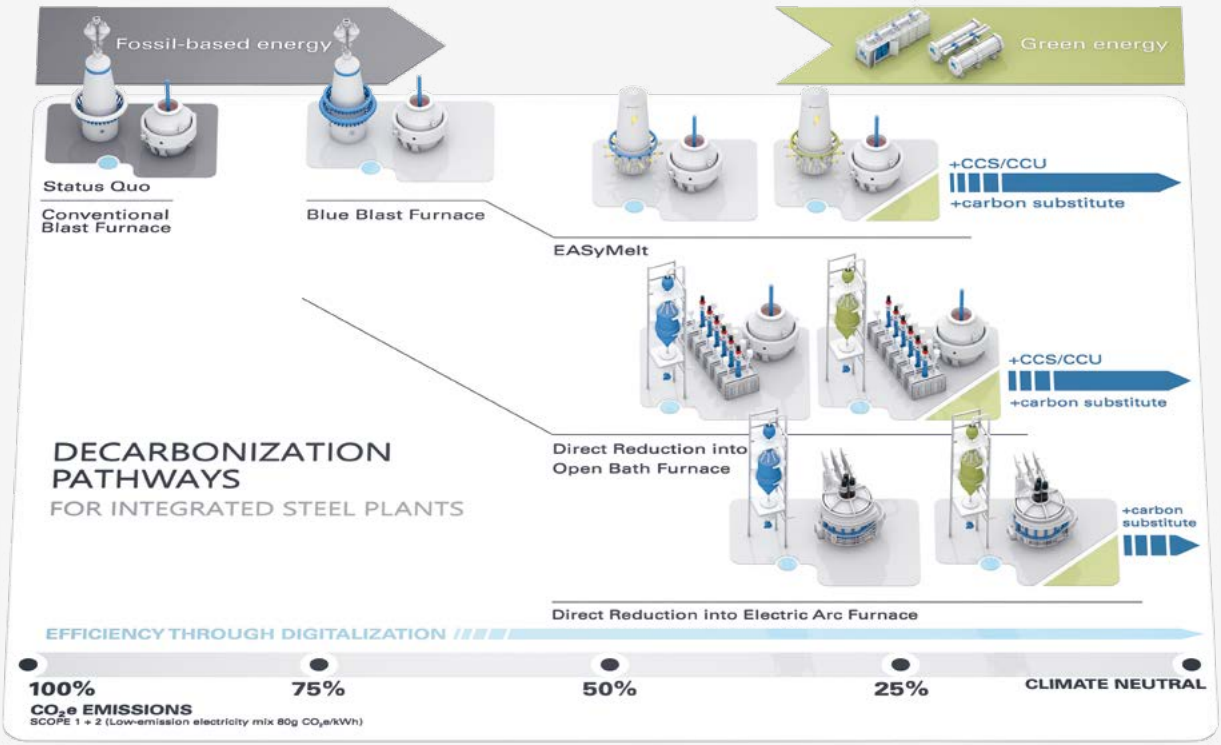
But that's by no means the only benefit. Recycling is a significant factor in saving the earth's resources and makes us less dependent on what's still in the ground – it's also often an ethically sound alternative and reduces the dependency of countries without access to primary raw materials.

Now, recycling major metals is a well-established process worldwide, but we're also putting all our metallurgical know-how to use for bringing additional metals back into the circle. One crucial area in which we're making that happen is batteries. We have formed the joint venture Primobius to market recycling technology for recovering lithium, nickel, cobalt, and other materials from consumer electronics as well as lithium-ion batteries from electric vehicles. As the technology partner, the JV is currently helping Mercedes-Benz build a recycling plant that uses our two-stage recycling process and hydrometallurgical treatment facilities to achieve impressive recovery rates.

What's the outlook for SMS group and plant engineering companies like you?

BD — Transforming the metals industry will take more than a generation. In order to meet international climate goals by 2050, about 35 million tons of crude steel capacity must 'go green' every year. These days, we're putting a lot of resources into gearing up our capacity to meet that demand. That includes people, of course. For purpose-driven individuals on a sustainability mission, plant engineering is the place to be. ●

Pathways towards green steel



The technologies for achieving climate-neutral steelmaking are available right now – ready to be implemented in existing and future plants. How, what, when, and where that can happen depends on several factors. Thankfully, there is an SMS group solution available for any scenario.

The green transformation of the steel industry is a marathon, not a sprint. By the middle of this decade, lighthouse projects like H2 Green Steel will prove that carbon-neutral steel production is possible. However, due to the long investment cycles for metallurgical plants, a large part of future CO_2 savings must come from the conversion of existing mills. Here, there is no one-size-fits-all 'best' option. That's why we have tailor-made solutions for any customer scenario that take into account local conditions such as iron ore quality, energy infrastructure, and existing equipment, as well as local policies, rules, and regulations.

All three major decarbonization routes have the potential to achieve climate neutrality by introducing innovative integrated process solutions in new (greenfield) or existing steel (brownfield) plants and by putting in place additional infrastructure for the use of fossil-free energy sources like hydrogen, biomass, or green electricity. Carbon capture can further be applied to go the last mile towards climate neutrality.

Brownfield case: Blue Blast Furnace modernization

Today, the integrated, 'primary' Blast Furnace-Basic Oxygen Furnace (BF-BOF) route is the dominant configuration for iron and steel production. Despite its high CO_2 emissions resulting from the use of large amounts of iron ore, mostly with low iron content, and limited amounts of scrap, blast furnace technology remains a crucial component of the iron and steel production process. Rapid greenhouse gas emissions reduction requires the gradual conversion of existing plants and infrastructure. That's why we have developed the Blue Blast Furnace technology as a bridging technology on the path to a greener future in steel production.

The defining feature of the Blue Blast Furnace and the first main step towards EASyMelt is the generation of syngas and its injection through a new bustle pipe at the lower shaft portion of the blast furnace to achieve emission reductions of up to 28 %. Synthesis gas – or syngas – consists primarily of carbon monoxide and hydrogen and performs as a reducing gas to enable a reduction of the iron burden in the shaft, thus replacing coke.

The gas may be produced via a variety of technologies. One is a new reforming process, the so-called dry reforming of coke oven gas in reformer stoves, during which blast furnace gas and coke oven gas are reformed at a high temperature. Since the process only uses exhaust gases from the steel plant and can replace coal, the potential to reduce CO_2 is high. Apart from the reformer stoves, there are other available technologies to produce syngas, like the reforming of natural gas or coke oven gas and tar.

Brownfield case: Upgrade with EASyMelt

Based on, but going beyond the emission reduction potential of the Blue Blast Furnace, SMS group is developing EASyMelt. This electric-assisted syngas smelter will function as an alternative to the direct reduction route and as a complementary block for filling the gap between iron ore availability and green steel demand. →

DRY REFORMING AT ROGESA

Paul Wurth has successfully operated a syngas pilot plant in Dillingen, Germany at ROGESA Roheisengesellschaft Saar mbH for testing the dry reforming process of coke oven gas with blast furnace gas. The first months of operation have proven the feasibility of the process, with excellent conversion ratios of up to 98 %. The produced syngas has the optimum composition and temperature for versatile use, such as reducing gas in the BF process, significantly surpassing the syngas quality produced by traditional catalytic reforming processes. The quality and high temperature of the reducing gas allows the utilization at shaft level and tuyere level.



SMS group offers solutions to decarbonize existing blast furnaces.

30%

BLUE BLAST FURNACE
By retrofitting existing blast furnaces, CO_2 emissions can be reduced by around 30 %.

The concept aggregates the latest technologies developed by Paul Wurth for substituting the traditional blast furnace in integrated steel plants and helping them achieve carbon neutrality. EASyMelt is an electrified direct reduction and melting process, using a minor quantity of coke to entirely replace the traditional hot blast with gases like coke oven gas, natural gas, hydrogen, and ammonia. Depending on the energy input, the technology can achieve emission savings of above 60 % compared to the traditional BF-BOF route. Remaining direct emissions can be reduced by applying carbon capture or through the use of biomass or biogas as feedstock. Using existing plants as a basis, EASyMelt is less CAPEX-intensive than any other low-carbon ironmaking technology.

The process is flexible in its input, adds resilience against supply shortages and market volatility, and can be adapted to various scenarios. Most importantly, however, traditional sinter feed may still be used in EASyMelt, avoiding fierce competition for the limited supply of (high-grade) pellets resulting with its energy flexibility to highly competitive operational costs. Just like the Blue Blast Furnace, EASyMelt can be realized in a step-wise approach of implementing several technological elements that work together to net-zero ironmaking. The central elements are the shaft injection of reducing gas, plasma-based superheating of the tuyere injection, and finally, the capturing of remaining emissions for storage or utilization.

Brownfield case: Direct reduction into open bath furnace

Another leading candidate in the race to decarbonize existing sites is the combination of the well-proven MIDREX® direct reduction process using a shaft furnace and an open bath electric furnace (OBF) for substituting existing blast furnaces SMS group supplies this combination of hydrogen-powered direct reduction plant, OBF and BOF steel making to thyssenkrupp Steel in Duisburg. Learn more about this lighthouse project on page 14.

The technology combines two key processes: the direct reduction of iron ore in a shaft furnace and the conversion of the resulting sponge iron into high-quality steel. Initially, it is possible to run the direct reduction plant (DRP) on a natural-gas basis, gradually introducing hydrogen at higher rates.

The OBF is similar in design to a conventional Submerged Arc Furnace (SAF) operated in a so-called 'brushed arc' mode. SMS group has several hundreds of references for these kinds of furnaces.

SMS group supplies this combination of hydrogen-powered direct reduction plant, OBF, and BOF steel making to thyssenkrupp Steel in Duisburg. Learn more about this lighthouse project on page 14.

IRONMAKING WITH MIDREX® TECHNOLOGY

Based on a construction license agreement, Paul Wurth supplies MIDREX® direct reduction ironmaking plants as part of its portfolio. Midrex offers three main technologies bridging the transition from 100 % natural gas to 100 % hydrogen:

> MIDREX NG™ allows up to 30 % of natural gas to be replaced with hydrogen without equipment modifications.

> MIDREX Flex™ provides the flexibility to operate on any mixture of natural gas and hydrogen (up to 100 % hydrogen) with some minor modifications.

> MIDREX H_2™ is designed to use up to 100 % hydrogen in a MIDREX® shaft furnace as feed gas.

The DRP-OBF route is suitable for both brownfield and greenfield projects. In existing steelworks, this combination replaces the BF and its associated sintering, stove, and coke facilities. The ideal combination of a DRP and associated OBFs is to have both installed alongside one another from the start. This enables hot charging DRI to the OBF, making use of sensible energy to lower the specific energy consumption.

The combination of direct reduction based on natural gas together with an OBF already reduces CO_2 emissions by about 50 % compared with the conventional BF-BOF route. These emission savings are achieved thanks to the higher hydrogen content in natural gas. In a second step, the natural gas can gradually be replaced with hydrogen as a reducing gas, which allows for further CO_2 reduction of up to around 65 %.

One of the main benefits of this technology is that it reduces the need for coking coal, a key ingredient in traditional steelmaking processes. The direct reduction with OBF and BOF converter technology is highly flexible and adaptable. Today's direct reduction shafts require pellets or high-grade lump ore. The OBF would then ideally be charged with the hot DRI, significantly reducing electrical energy consumption. Alternatively, the OBF also accepts any pre-reduced iron ore feed, including hot briquetted iron (HBI), cold DRI pellets, or even DRI fines. Thanks to its reducing nature, the OBF is not sensitive to low ore quality, addressing the electric arc furnace's inefficient processing of low-grade iron ores and making hydrogen-based green steel from low-grade ore more feasible in the future. In addition to the hot DRI fed to the OBF, up to 10 % of the OBF →

60%

BROWNFIELD CASE

In a brownfield case, 60 % and more CO_2 emissions can be saved by transforming existing BF-BOF plants via the EASyMelt or DRP-OBF route.



The DRI plant of Algerian Qatari Steel (AQS) was supplied by Midrex and Paul Wurth as consortium partner.



H2 Green Steel will be the first reference worldwide for this case. Learn more about it on page 20.

material feed can be comprised of agglomerated waste or free-flowing scrap. This allows steel plants to consume wastes from their existing facilities by utilizing an inexpensive agglomeration process to prepare these for addition to the furnace. The OBF can also generate a slag similar to BF slag that can be granulated and valorized in the cement industry.

Greenfield case: Direct reduction into an electric arc furnace

In a greenfield project and with green hydrogen available at competitive prices in sufficient quantities, the combination of direct reduction and electric steelmaking is the best solution.

To operate any direct reduction technology while remaining competitive, sufficient natural gas or green electricity are a necessity. This is the reason why gas-based direct reduction plants have been built in locations like the Middle East, North Africa, North America, and Russia. The pre-reduced high-grade grade iron ore pellets are reduced in a MIDREX® shaft and then fed into an electric arc furnace as hot DRI. The EAF then melts the material and produces liquid steel. No intermediate step is required, and – depending on the MIDREX® technology in use – only minor carburization is needed to reduce the nitrogen in the steel.

Switching from natural gas use to renewable hydrogen, this route comes closest to carbon neutrality. The carbon content of low to zero carbon DRI resulting from H_2 reduction may be modified in the lower cone, also called the cooling zone, of the shaft furnace. Scrap can be added to the EAF with only the potential scrap contamination and quality requirements of downstream processing stages setting an upper limit. This route is particularly interesting for greenfield projects – hence on newly constructed steelmaking sites. ●

95%

GREENFIELD CASE

In greenfield projects, a CO_2 emission reduction of up to 95 % can be achieved with a DRP-EAF steel plant setup based on green electricity and hydrogen.

Learn more about our Green Steel technologies:

Turning the hydrogen talk into action

Green hydrogen plays a pivotal role in decarbonizing most industries. SMS group is actively shaping the production, supply, and integration of hydrogen in industrial plants to reduce carbon emissions.



GrInHy2.0 project
©Salzgitter AG

Learn more about our hydrogen activities:

SMS group subsidiary Paul Wurth is a strategic investor and technology partner of Sunfire. The two partners are working together on delivering hydrogen units consisting of the Sunfire high-temperature electrolyzer (Solid Oxidizer Electrolyzer Cell, SOEC) and the downstream hydrogen processing unit (HPU) by Paul Wurth. Two projects show the integration of SOEC-HPU technology.

GrInHy2.0: Green hydrogen for green steel

At Salzgitter Flachstahl, Germany, Paul Wurth designed GrInHy2.0 (Green Industrial Hydrogen) hydrogen processing unit and Sunfire's SOEC electrolyzer have successfully produced almost 100 tons of green hydrogen. Since start-up in March 2021, the renewable hydrogen produced has been sent directly into Salzgitter Flachstahl's hydrogen grid and has been used for annealing and galvanizing. The high-temperature electrolyzer is considered the world's largest one currently installed in an industrial environment. The electrolyzer cell has been able to reach new efficiency standards with a high electrical efficiency and record-high renewable production rates.

MultiPLHY: Hydrogen for biofuels

The MultiPLHY in Rotterdam, Netherlands, was launched in January 2020 with the objective to install, integrate, and operate the world's first high-temperature electrolyzer (HTE) system on a multi-megawatt scale.

Paul Wurth will supply and commission the HPU, which will condition more than 60 kg/h of renewable hydrogen supply to the refinery's existing hydrogen grid at a pressure of 30 bar. The HPU receives hydrogen from Sunfire's SOEC technology and includes buffering, compression, cooling, drying, and quality monitoring of the gas. MultiPLHY is the first demonstration of an HTE in an industrial refining process, with a nominal power input of 2.6 MW, achieving an electrical efficiency of up to 85 % AC to LHV H_2. ●

Green revo



The move away from traditional blast furnaces at thyssenkrupp Steel's mill in Duisburg has begun. From 2026, a new direct reduction plant operated with green hydrogen will take over part of the iron production process. It is one of the largest industrial decarbonization projects in the world – realized by SMS group.

lution



The Rhine River flows in a wide curve past the steel mill at thyssenkrupp Steel Europe AG in Duisburg. The quay wall of the south port is where countless ships will soon unload a rather special cargo: many thousands of tons of construction material for the new direct reduction plant (DR plant), with which Europe's largest steelmaking site will usher in a new era of climate-neutral production. The DR plant, which in the future will use hydrogen as reducing agent for crude iron production, is scheduled to be completed in 2026.

Everything from a single source

The construction project in Duisburg is an undertaking that is packed with superlatives, comprising two open bath furnaces, a slag granulation system, and related ancillary equipment in addition to the DR plant, which boasts a capacity of 2.5 million tons per year. SMS group will implement the order as a turnkey project. In other words: SMS bears overall responsibility for the engineering, procurement, and construction of the plant, including the accompanying structural and civil engineering services, as well as the infrastructure and utilities supply.

This order marks a record for us. "It is by far the most extensive single order in the over 150 years of SMS group's history," says Hubertus Jakobi, Executive Vice President Implementation, adding: "Of course, achieving this kind of success is something to be pleased about, but it also leaves you awestruck at the same time. Projects of this magnitude always →

involve hurdles, yet they also represent a huge opportunity. We are delighted to fully exploit our comprehensive expertise in plant engineering and project management. SMS colleagues from all around the world will be working on the project."

A win-win for both industry and the climate

Currently, the thyssenkrupp Steel plant in Duisburg generates around 20 million tons of CO_2 every year, which is 2.5 % of Germany's overall figure. "Thanks to the direct reduction plant, we can expect to make annual savings of more than 3.5 million tons of CO_2," says Dr. Marie Jaroni, Head of Decarbonization at thyssenkrupp Steel. This projection shows how central the new plant is to the company's 'tkH2Steel' decarbonization strategy. Referring to the objective of the transformation concept, Marie Jaroni gets straight to the point: "It's a well-known fact that large quantities of CO_2 are released during coal-based crude iron production. thyssenkrupp Steel plans to cut its CO_2 emissions by well over 30 % by 2030 and produce steel in a climate-neutral manner by 2045 at the latest." There is already a sharp increase in demand for steel with a low carbon footprint, according to the decarbonization expert: "This is something we see in end-user industries and processing industries, in particular. From 2030 onwards, thyssenkrupp intends to produce five million tons of CO_2-neutral steel per year."

Hydrogen-based processes in direct reduction plants are playing a key role in the green transformation of the steel industry. For the first time, the Duisburg facility combines a DR plant with electrical smelters. The open bath furnaces, which are to be operated with green power going forward, will be built right next to the DR plant so that iron ore can be converted into hot metal then and there. SMS is engineering the DR plant in such a way that it fits perfectly into the existing infrastructure of the Duisburg steelworks. "Only the first phase of iron production will change, all



The new direct reduction plant will be constructed at the northern end of the Duisburg site.

"Success can only be achieved by a joint effort!"

— Hubertus Jakobi, Executive Vice President Implementation SMS group

"Thanks to the direct reduction plant, we can expect to achieve annual savings of more than 3.5 million tons of CO_2."

—Dr. Marie Jaroni, Head of Decarbonization at thyssenkrupp Steel

3.5

MILLION TONS OF CO_2 emissions will be avoided every year thanks to the direct reduction plant in Duisburg.

2.5

MILLION TONS is the annual capacity of the DRI plant.

90,000

TONS OF EQUIPMENT and structural steel are needed for the new facility.

175

METERS TALL will be the largest crane at the site.

the other downstream process stages will stay the same. Even the well-known premium steel grades produced there will not be affected," explains Marie Jaroni.

Unique in every way

At the northern end of the facility premises, near the south port, the forklift trucks are in continuous use. They are gradually removing the slabs that were in temporary storage here to make room for the new centerpiece of the metallurgical plant. The excavators will soon move in to transform the gray, asphalted area into a gigantic, 500 by 500 meter pit.

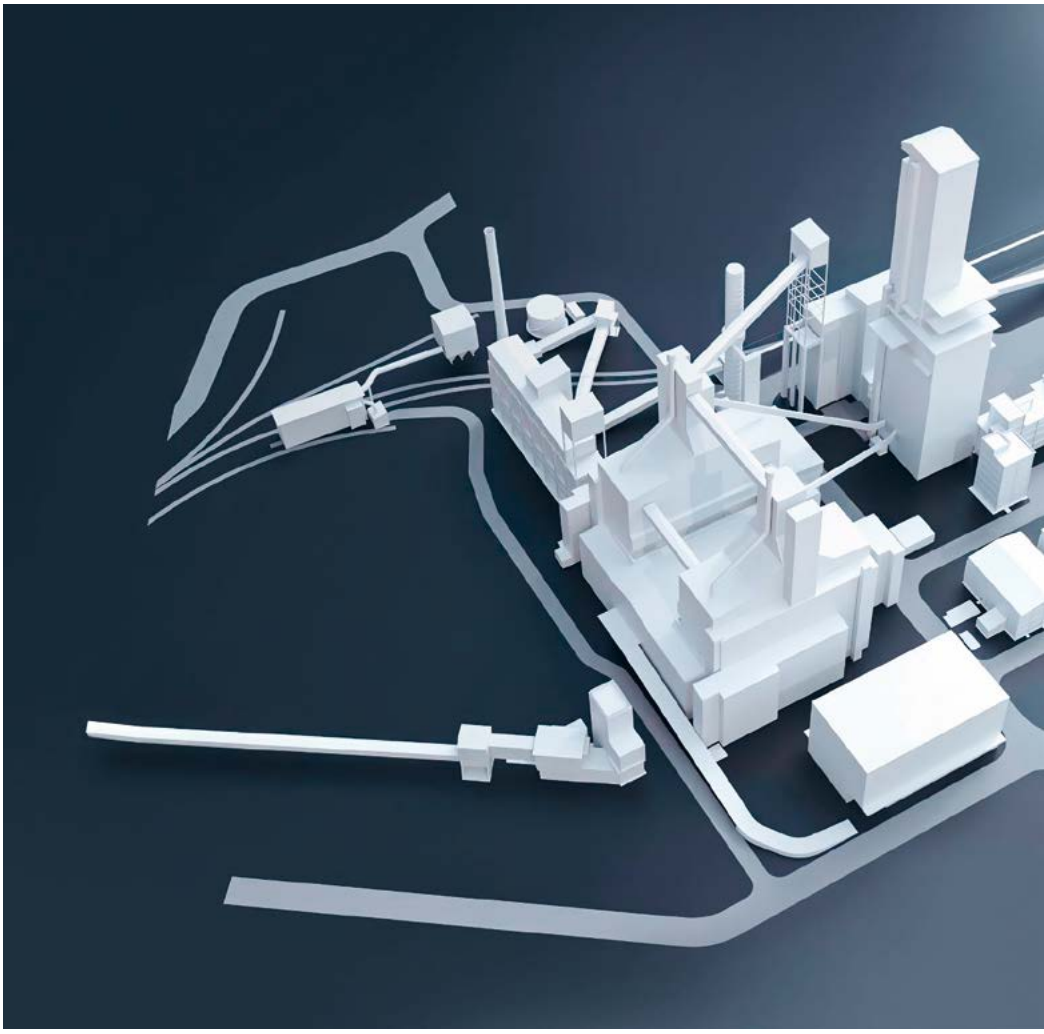
Having worked at thyssenkrupp Steel for over 30 years, Harald Espenhahn has experienced many construction projects, but the Head of Technology & Environment at thyssenkrupp Steel is particularly looking forward to this one. "This project symbolizes a unique shift in the European steel industry," he explains. "thyssenkrupp Steel is investing in this DR plant because we firmly believe that steel has a future in Europe. At the same time, we want to press ahead with the transformation of our industry with this flagship project."

The preparatory work for the construction of the DR plant is already running at full speed. Hubertus Jakobi expects a total of around several million hours to be earmarked for the plans. At the top of the project team's to-do list is the timely completion of all permit and approval procedures. "SMS is fully committed to supporting thyssenkrupp Steel in obtaining the necessary permits," says Jakobi. At the same time, engineering and procurement activities are being ramped up. "We need to specify 90,000 tons of equipment and steel structures, organize the supply chain, and make sure that everything is supplied to the site just in time. Regular operation of the steelmaking facility continues uninterrupted at the same time." He adds that plans also needed to be made for deploying one of Europe's largest cranes on the site, which stands 175 meters tall.

A well-established team

SMS group and thyssenkrupp Steel have collaborated on many occasions in the past. To manage the construction of the DR plant in Duisburg, however, the project teams from both companies →

Model of DR plant, open bath furnaces, and ancillary equipment



Harald Espenhahn and Hubertus Jakobi (2nd and 3rd from the right) after signing the contract with project owners from thyssenkrupp Steel and SMS group



Dr. Marie Jaroni



now have to collaborate more closely than ever. To facilitate this, they plan to hold regular workshops and teambuilding activities. "It is important that we establish good communication formats because the project team will continue to grow tremendously during the different construction phases," adds Hubertus Jakobi. "We are currently talking about a core team of around 80 people. There will be times when there will be several hundred people involved who need to communicate effectively with each other."

Looking at the very constructive run-in phase that has been ongoing for a year now, Harald Espenhahn is confident when it comes to future cooperation: "Our decision to choose SMS group as our partner was a very conscious one, because our corporate cultures are similar and we anticipate minimal frictional losses." Hubertus Jakobi goes on to say: "Of course, with such a massive construction project, you can't make specifications that cover everything right down to the last nut and bolt. We will have to find solutions to problems that we cannot even imagine today – and no doubt we will have to reconcile differing opinions here and there. Ultimately, though, we all know that with a project of this magnitude, this means one thing: success can only be achieved by a joint effort!"

Future in the making

The fact that the traditional blast furnace is to be replaced after several centuries of use, and CO_2-intensive steel production will be successively superseded by climate-friendly technologies represents an unprecedented industrial transfor-



mation. All project partners working together in Duisburg are aware of the historic significance. SMS group is proud to experience this process up close and personal and play a part in shaping it. "Our colleagues working on the project are extremely motivated," says Hubertus Jakobi. "It is hugely important to us all to make a substantial contribution, not only to minimizing CO_2 emissions, but also to securing the future of the steel industry in Europe." ●

Read more online at:
www.sms-group.com/plants/projects/tkse

Groundbreaking

SMS group will realize a groundbreaking technological concept by combining a MIDREX® direct reduction plant and two innovative electric smelters for the production of 2.5 million tons of direct reduced iron (DRI) per year. This combination enables blast furnace technology to be replaced without the need to adapt downstream facilities from steelmaking to the finished product.

Direct reduction

The direct reduction plant is based on MIDREX Flex™ technology, which allows it to operate with any mixture of natural gas and hydrogen (up to 100 % hydrogen) with only minor modifications. The hot DRI will be directly charged into the electric smelters in order to reduce energy consumption.

Smelters

The electric smelters are also known as open bath furnaces (OBF). The name results from the fact that the bath around the electrodes must be kept free of metallic feed, in order to avoid contact between the electrically conductive DRI and electrodes. They are similar in design to conventional submerged arc furnaces. For these electrical reduction furnaces, we can rely on several hundred references, including the largest furnace in the world.

Slag granulation

The slag granulation system is based on the INBA® slag granulation process, incorporating our proprietary dynamic INBA® dewatering drum. The INBA® cold water process in conjunction with steam condensing granulation has officially been recognized as 'Best Available Technology (BAT)' under European Community directives. With about 300 reference installations, it is the most common and effective route for processing blast furnace slag in the world.

Advantages

— Flexible transition from natural gas to hydrogen
— Flexible use of input materials: MIDREX® furnaces can be operated with pellets or high-grade lump ore. Quality-wise, blast furnace pellets as low as ~61 % Fe have been proven to work reliably over longer periods with the MIDREX® technology
— Consistently high product quality: Customers will continue to receive the complete, high-quality product portfolio with the same specifications compared to the blast furnace process route
— Seamless integration and efficient use of existing steelmaking and downstream plants
— Production of blast furnace equivalent slag as a by-product for utilization in the cement industry as a clinker substitute. The replacement of primary material in cement saves about 800 kg of CO_2 per ton of substitute

"We will get

H2 Green Steel enlists SMS group to build the world's greenest steel plant. In this interview with H2 Green Steel's CTO Maria Persson Gulda, chief project manager Christian Geerkens, and iron-making expert Cristiano Castagnola of SMS group, we're taking a closer look at the project, the technology, and the changes it will bring to the steel industry.

Maria Persson Gulda
CTO of H2 Green Steel



Maria, could you get us started by summing up the mission of H2 Green Steel in one sentence?

Maria Persson Gulda—The main goal of H2 Green Steel is to accelerate the steel industry's green transition. To that point, I don't think it is a coincidence that the European steel industry has shortened the time horizon for its decarbonization by more than ten years since this project came to life. We welcome that very much.

Why did you choose a small town 80 km south of the Arctic Circle for this mission? Why Boden?

MPG—Boden is just a wonderful place. People here live close to nature and care deeply about protecting it. They are excited about having a global lighthouse project for the transformation of the steel industry in their town. However, there are additional reasons why this is the perfect place for this project. Here, three decisive factors come together: energy, infrastructure, and competence.

the best



Christian Geerkens
Chief project manager
of SMS group

In terms of energy, we need two gigawatts of green electricity to produce hydrogen on-site, operate the electric arc furnaces, and electrify the downstream processes. Most of our electricity comes from hydropower. The river right next to the site can provide 14 to 15 terawatt hours of electricity. Also, Boden has an excellent connection to the national electricity grid. Therefore, it's an optimal location for the supply of green energy.

The logistics infrastructure is also outstanding. Boden is on the railway line that runs from the iron ore fields in northern Sweden to the Baltic Sea, where we can ship out all our products and materials.

And last but not least, it's the people. This region has a lot of metallurgical competence in both mining and steelmaking. Luleå, which is only 30 minutes away, hosts one of Sweden's largest technical universities with a very strong focus on metallurgy. The municipality of Boden and regional authorities are also wonderful partners in helping us get all the permits we need to realize this project. →

technology"

Christian, could you please briefly describe the plant technology?

Christian Geerkens — H2 Green Steel has set up the plant technology to produce flat steel according to the highest quality standards to serve the automotive industry. The plant will produce steel from virgin material with DRI (direct reduced iron) technology. In the first phase, H2 Green Steel will build one MIDREX® plant with an annual capacity of 2.1 million tons. The steelmaking plant will consist of two electric arc furnaces with energy recovery systems, two twin ladle furnaces, and an RH (Ruhrstahl Heraeus) degasser. Downstream, SMS group supplies a CSP® Nexus (compact strip production) plant for casting and rolling, a combined pickling line and tandem cold mill, and three different processing lines: a combined annealing and galvanizing line, a continuous galvanizing line and batch annealing furnaces. The overall capacity for the steel plant is about 2.5 million tons per year.

Let's go into some more detail: What are the 'green' technologies for steel production?

MPG — With minor exceptions, the entire process is designed to run without carbon-based fuels. First, the DRI plant supplied by Paul Wurth and Midrex will run with 100 % hydrogen right from the start. For hydrogen production, we will have different types of electrolyzers: the baseload will be produced with alkaline electrolyzers, as this is currently the most proven technology. On a smaller scale, we will install high-temperature electrolyzers because they are much more efficient and use the steam from the electric arc furnace. We want to learn from that and maybe install more capacity in the next phases.



Cristiano Castagnola
Iron making expert of
Paul Wurth

> "The DRI plant will operate with 100 % hydrogen."
>
> — Maria Persson Gulda

Cristiano Castagnola — As Maria said, the DRI plant will operate with 100 % hydrogen. This is a major breakthrough as today, all industrial DRI plants are operated with gases from fossil sources, mainly natural gas. The major difference in the setup of a plant conceived to operate only with hydrogen is that electrical process gas heaters replace the reformer. In a conventional natural gas-based MIDREX® DRI plant, the iron ores are reduced by hydrogen and carbon monoxide syngas. This syngas is produced by reforming the natural gas before sending it in the shaft furnace.

When operating a DRI plant only with hydrogen, you must heat up the hydrogen to increase the energy level for the chemical reduction needed to remove oxygen from the iron ore pellets to generate metallic iron. In H2 Green Steel's MIDREX® plant, this is not done through a gas-gas heat exchange between the process gas and combustion generated off-gasses, as it is done in all industrial processes, and the reformer. Instead, we use a set of innovative large-scale electric heaters. This novel solution allows for significant energy savings, as it eliminates the need to transform electricity into hydrogen for gas heating, which is inevitably associated with yield loss.

CG — The electric arc furnaces are, of course, operated with electricity from renewable sources. That's quite novel in and of itself. To reduce energy consumption in steelmaking, we will hot-charge DRI into the furnaces. It's not the first plant in the world combining a DRI plant and EAF with hot-charging, but it's very leading-edge. We will also have two energy recovery plants producing steam for the electrolyzers and downstream processes.

We have electrified most heating processes in the rolling mills and processing lines. For example, in the CSP® Nexus plant, we will replace the gas-fired tunnel furnace with a combination of induction heaters and electrically heated roller tables. Also, heating the cold rolled strip in the galvanizing lines is done with electrical energy instead of gas-fired burners. Last but not least, the batch annealing furnaces are also powered by electricity.

MPG — So far, we have only discussed reducing the carbon footprint. But we will realize more groundbreaking, disruptive innovations at H2 Green Steel. For example, we have worked with SMS, Paul Wurth, and Midrex to increase the circularity of the plant. We will dispatch no water into the river, circulate all the gases, and use the off-heat for the high-temperature electrolyzers. Circularity is an essential concept for us.

There's another notable disruption that's important to us: steel plants worldwide are very homogenous regarding the nationality and gender of their employees. We want to bring the best people from all over the world to our steel plant. We especially want to attract women to work for us. Today, we are 40 % women at H2 Green Steel, even 50 % in the management team, and we want to maintain that level for the operation of the plant. From the start of the project, our mission to 'go green' has attracted a more diverse set of people to the steel industry, which is very exciting.



Architectural visualization of H2 Green Steel plant

Why did you choose SMS group as a partner for this project?

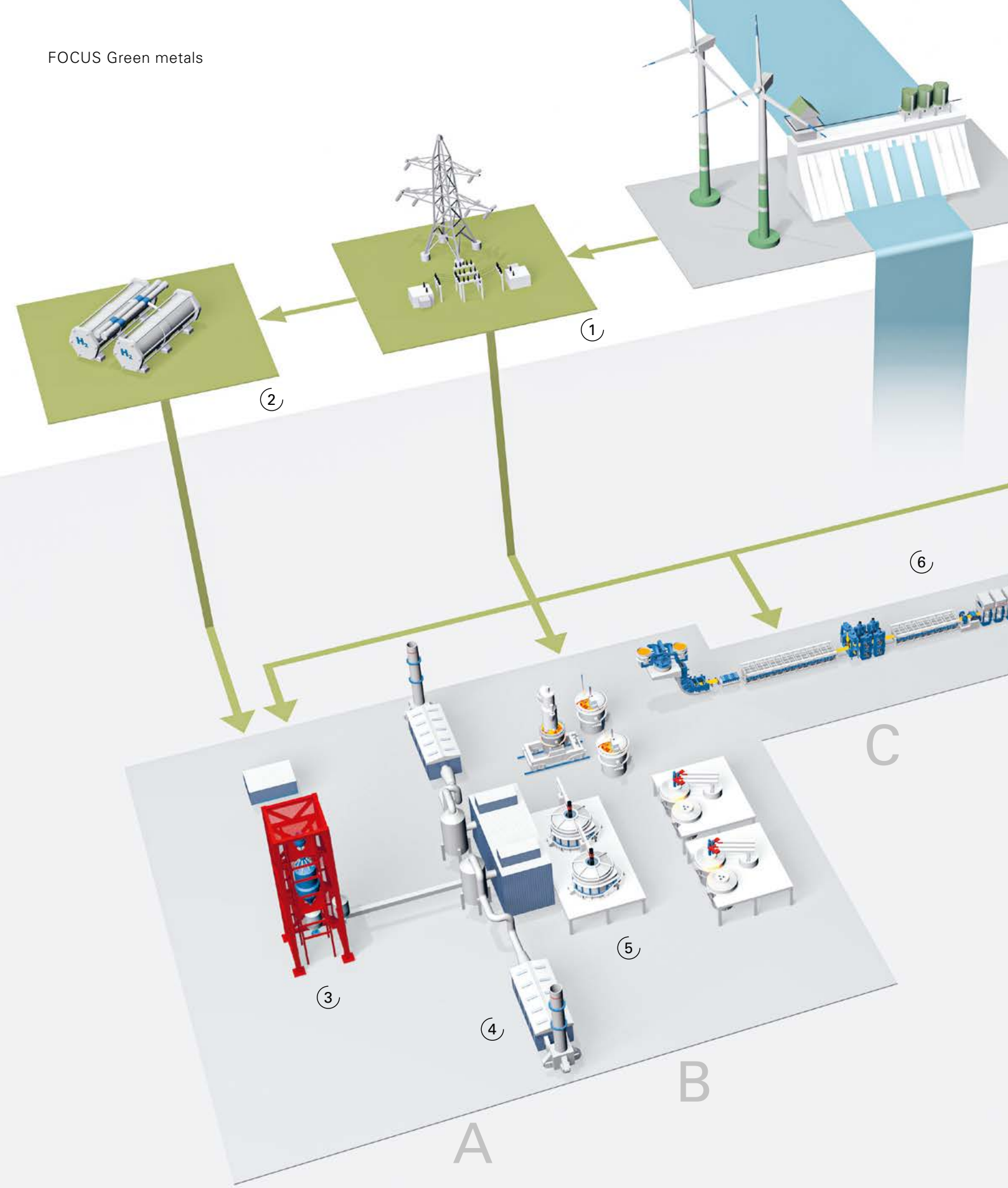
MPG — The combined technology we are getting from the consortium of MIDREX®, Paul Wurth, and SMS group is the best technology for reducing iron ore and producing high-quality flat products based on 100 % hydrogen and green electricity. We have come to this decision after discussions with all suppliers.

Regarding MIDREX®, the most significant advantage of their technology, from the perspective of a steel producer, is that it is designed to use lower-grade iron ores. H2 Green Steel will mainly feed high-grade iron ore from Sweden into the DRI plant, but MIDREX® technology gives us the highest flexibility with respect to the iron ore supply chain.

What are the next steps? What is the reaction of your customers to this project?

MPG — Commissioning of the plant is scheduled for 2025, followed by the production ramp-up in 2026. And the reaction from our customers is very positive. We have already sold 1.6 million tons of steel to sustainability leaders in all kinds of industries. In the automotive and commercial vehicles industry, we have customers like Mercedes, BMW, Bilstein, and Scania. We also have appliance producers like Electrolux and Miele as customers.

CG — I would like to add that the Boden plant will be not only the world's greenest but also Europe's most modern plant. We supply the latest technologies for the production of high-quality steel strip. Take the CSP® plant as an example. It will be the second CSP® Nexus plant in the world and the first of this kind in Europe. With its new high-throughput caster, it will be possible to produce 2.5 million tons per year on a single strand, almost entirely electrically powered. The strip width of 1,950 mm will give H2 Green Steel a competitive advantage. It is the first time in decades that a project of this size will be realized in Europe, and we are incredibly proud that it will be supplied by SMS group. ●



1. FOSSIL-FREE ELECTRICITY
All electricity requirements of H2 Green Steel will be covered by renewables.

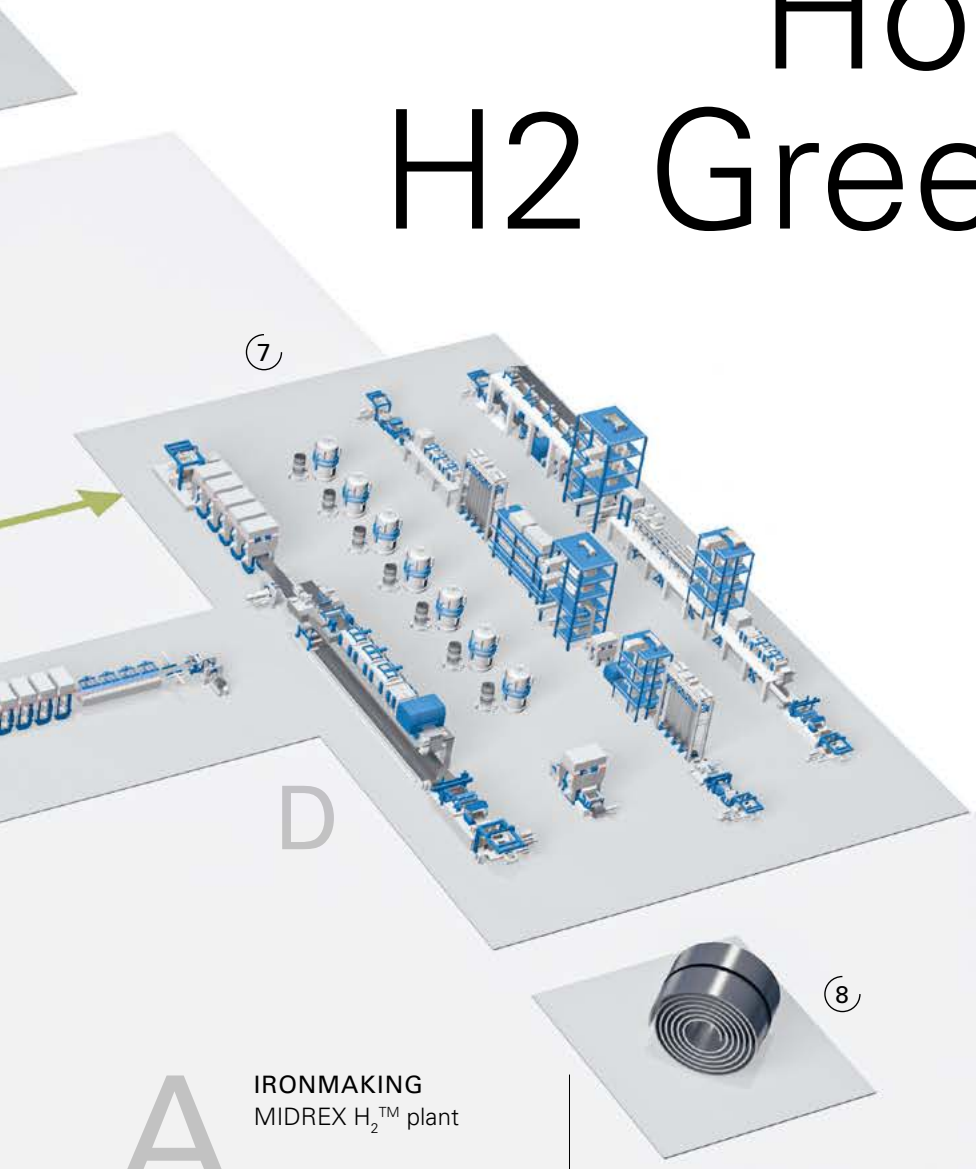
2. GREEN HYDROGEN
Giga-scale electrolyzers with a capacity of 800 MW produce green hydrogen.

3.DIRECT REDUCTION
DRI made of 100 % hydrogen and high-grade iron ore.

4. ENERGY RECOVERY
Energy recovery plants produce steam for electrolyzers and downstream processes.

How does H2 Green Steel work?

Green energy, hydrogen, and the latest plant technology are the ingredients of H2 Green Steel – the world's first green steel plant.



A

IRONMAKING
MIDREX H_2™ plant

Capacity:
2.1 million t/year

B

STEELMAKING
2 Electric arc furnaces
2 Ladle furnaces
1 RH plant

Capacity:
2.6 million t/year

C

CONTINUOUS CASTING AND ROLLING
CSP® Nexus plant

Width: 900–1,950 mm
Thickness: 20–1.0 mm

Capacity:
2.5 million t/year

D

COLD ROLLING AND PROCESSING
Pickling line/Tandem cold milll
Combined annealing and galvanizing line
Batch annealing furnaces
Galvanizing line
Skin-pass mill

Width: 900–1,900 mm
Thickness: 2.50–0.25 mm

Capacity:
1.5 million t/year

5. STEELMAKING
Steelmaking based on DRI, scrap, and green electricity.

6. CSP® NEXUS
Electrical and induction heating replace natural gas to produce carbon-neutral hot strip.

7. COLD ROLLING AND PROCESSING
Electrification of annealing and galvanizing furnaces to achieve a green final product.

8. RESULT
High-quality flat steel with a 95 % smaller carbon footprint.

Navigating the global energy crisis with digital solutions

In order to move towards a green future, the global steel industry must drastically reduce its energy consumption. Digital solutions enable the comprehensive optimization of energy usage, meaning that up to 15 % less energy is consumed.



Digital solutions like Viridis help plant operators to reduce energy consumption along the entire process chain.

Learn more about our solutions:

According to Wood Mackenzie, greening the production of iron and steel by 2050 will require 52 megatons of green hydrogen, 2,000 gigawatts of renewable capacity (67 % of current capacity), 470 megatons of CCUS (carbon capture, utilization, and storage), five and a half times the current volume of high-grade iron ore, and twice the amount of scrap. That translates into an investment opportunity of 1.4 trillion US dollars along the entire value chain to achieve the 2050 net zero targets. Due to constraints in the global availability of hydrogen for industrial use, significant production output is expected only after the mid-2030s. In order to meet global net zero targets, additional measures must therefore be taken.

Increasing the energy efficiency of a production process is often perceived as a substantial and laborious undertaking that leads to an increase in costs and the need to replace equipment. In reality, a noticeable rise in the energy efficiency of a plant or production process can already be achieved with a relatively small investment of time and money – namely with digitalization. By using artificial intelligence, digitalization transforms data into knowledge and enables you to make confident decisions along the entire value chain.

Reduce energy costs with modern software solutions

When dealing with a wide range of objectives, variables, restrictions, and uncertainties, finding a feasible and optimal solution is not practical without the use of artificial intelligence tools. We are now in the era of industrial digitalization where software plays a crucial role. In pursuing the goal of meeting the need for more efficient, economical, and sustainable processes, companies in the steel industry should act now.

The starting point is to overcome the challenge of integrating the information from the many different areas of the plant. This not only means having a centralized source of information: much more than

that, it means integrating and centralizing the management of the multiple KPIs, ensuring that the goals from the different areas and organizational levels of the company are aligned. This is where our Viridis Performance solution comes in. This is an integrated energy and resource tracking application, which collects huge amounts of low-level data and provides performance management capabilities with KPIs, targets, analyses, events, measurement, and verification of efficiency initiatives, and standard operating procedures. It is a single source of truth for information about all energy flows and all relevant items of equipment. The application enables the information to be analyzed in its context and not separately, which means that the performance indicators define quantitative relations between assets at any level of the hierarchy and energy resources that represent their energy behavior. Context analysis dramatically increases the accuracy of forecast models, including adaptive targets.

Dealing with the management of steel plant gases means tackling a multitude of process restrictions, a variety of objectives, and a number of unexpected events. Viridis Dispatch is designed for the optimal dispatch of the process gases and fuels within the global process. It collects the production data and deploys forecasting, simulation, and optimization gas-flow models that enable the optimal use of off-gases and other fuels. With Viridis Dispatch, more than 50 % of the excessive gas that would be burned in flares is used within the process or for electricity generation. The results can be achieved solely by adjusting the process, without having to make any equipment modifications or disrupt production.

Viridis Process is an application that simulates the outcome of performance metrics under varying conditions and with different parameters, finding the best set for each operational state and helping decision makers to achieve the optimal condition. The application is capable of identifying and intervening in suboptimal process execution conditions as well as reducing electricity consumption, refractory and electrode wear, and nitrogen pick-up. Viridis Process can achieve a reduction in resource consumption in specific processes and equipment of up to 15 %.

As well as off-gases from steelmaking, however, several energy flows also need to be managed and optimized. Viridis Grids is responsible for the management of flows within the process, comprising electrical energy, nitrogen, argon, oxygen, and others. The application detects abnormal behavior and virtually eliminates leaks, resource waste, and unplanned load peaks by deploying precise consumption models developed with real-time data from the process and automated AI tools. It also provides detailed consumption forecasts based on the production plan and order schedule simulations. Viridis Grids enables the reduction of distribution issues due to overloading or a lack of resources, the reduction of financial losses from resource leaks, and contractual overage fines.

The management of emissions is a complex and time-consuming task, especially as the data are required from multiple sources and various calculation methods are involved. Viridis Carbon is the application that tracks in detail and in real time all the gaseous and particulate matter emissions from each process step – right down to the final product. It is able to issue certificates with information regarding the carbon footprint of each steel piece produced, thereby adding value to the products. The application does not work using estimates or averages, but rather with direct and indirect measurements, encompassing scopes 1, 2, and 3. It provides customers, stakeholders, and the relevant tax authorities with an additional level of transparency and governance. ●

FIVE STEPS TO GREATER ENERGY EFFICIENCY

1

Integrate the information from different areas of the plant. This means integrating and managing the multiple KPIs on a centralized platform to align goals from different areas and organizational levels.

2

Collect production data and deploy forecasting, simulation, and optimization gas-flow models that enable the optimal use of steel gases and other fuels.

3

Analyze process variability to find the best set for each operational state and ultimately to achieve the ideal conditions.

4

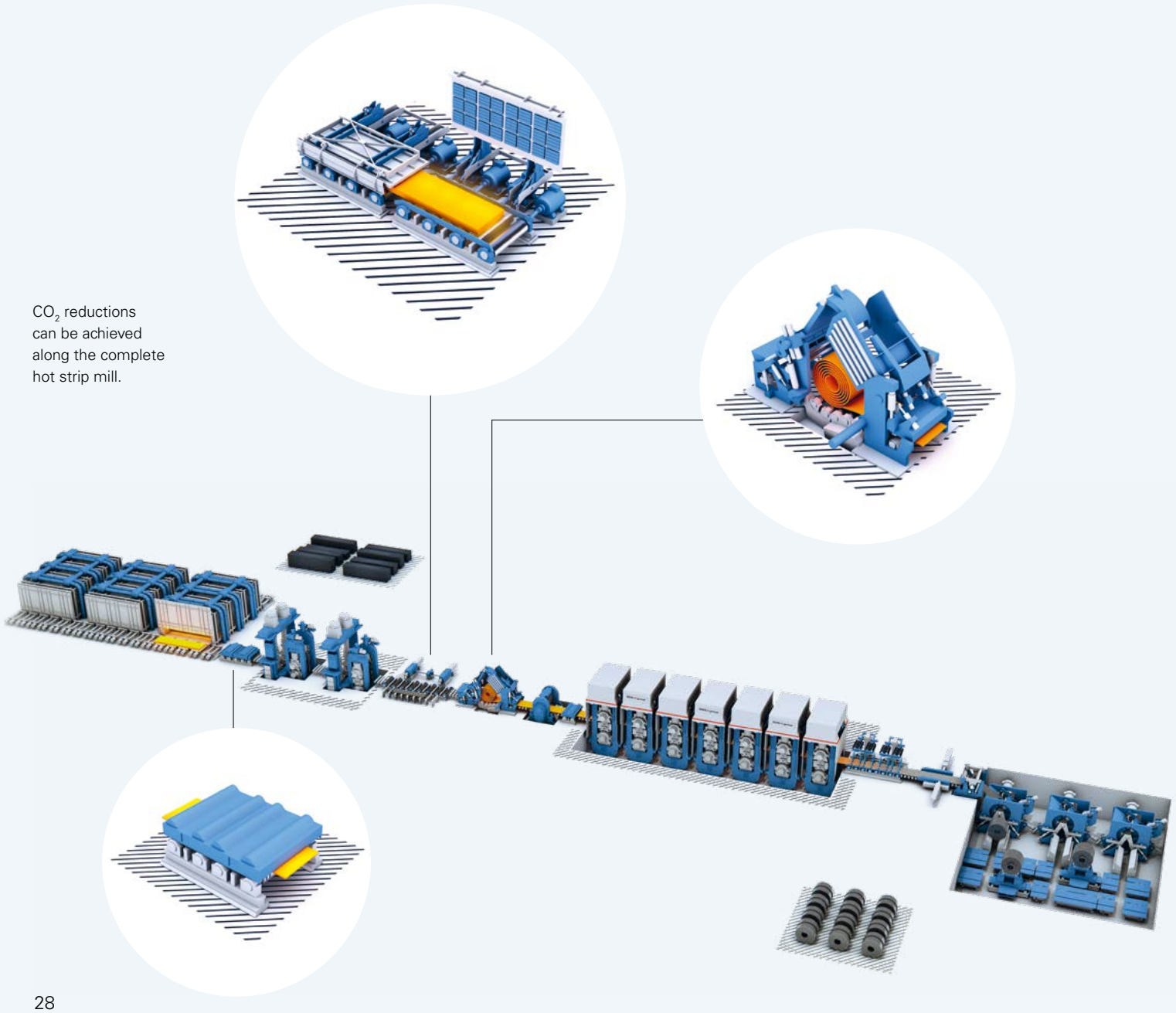
Identify leaks and instrumentation malfunctions in distribution grids and try to predict mismatches between energy and resource supply and demand.

5

Track all the gaseous and particulate matter emissions from each process step right down to the final product.

Milestones to

In the downstream part of a steel plant, hot rolling is one of the main sources of CO_2 emissions. We offer a range of solutions on the way to a green coil.



CO_2 reductions can be achieved along the complete hot strip mill.

wards a green hot coil

Around 80 % of the energy used in a hot strip mill (HSM) goes into slab reheating before the actual hot rolling process starts. Most reheating furnaces today still run on natural gas. All other processes and functions, including, for example, the mill stand drives, the hydraulic systems, and the ancillary facilities, require only around 20 % of the total energy demand.

Reheating furnaces

Today, the energy efficiency of the most widely used slab reheating furnaces is limited to around 55 % to 60 % because of unavoidable combustion gas losses. However, these losses can be utilized as an energy source for steam generation or low-temperature heating systems in other processes. In addition, there are opportunities for sustainably improving the energy balance of conventional gas-fired reheating furnaces and reducing the CO_2 footprint. Here are some of the potential optimization parameters and measures:

— Use of green hydrogen
— Oxygen enrichment of air
— Improvement of air/fuel control
— Increasing air temperature, for instance, with regenerative burners
— Improvement of thermal insulation for roof beams, adiabatic walls, and coating
— Increasing the charging temperature or lowering the discharging temperature
— Process-control-optimized heating

SMS group's experts can help customers evaluate their existing furnace units and recommend specific measures for improvement, which can be implemented as part of a modernization project.

Electric and hybrid reheating

Electrically heated reheating furnaces would significantly increase the efficiency because combustion gas losses are eliminated. It's generally a conceivable option, but the complexity of the material and process control in a hot strip mill does not allow natural gas-operated furnaces to be replaced with fully electric furnaces as easily.

Another approach focuses on a hybrid heating solution of gas and inductive heating. One solution is to use an inductive heater for preheating. In this case, the slab reheating furnace is used to achieve the slab extracting temperature. A further solution is the hot direct rolling approach, where the hot slabs coming from the casting machine are post-heated slightly with inductive heaters to rolling temperature. In this case, a gas-fired furnace is not required at all.

Rolling mill

As conventional descalers entail high water consumption and a significant need for pumps and their energy costs, we developed the PIROSCALE® descaler as a technical solution.

The PIROSCALE® features rotating nozzle heads arranged in a row, synchronously driven. The design provides advantages like saving pumping energy →



You can find more information on energy and emission savings in hot strip mill on our website.



"We have uncovered the hidden CO_2 savings potentials for hot strip mills and achieve significant savings during plant operation."

— Wolfgang Fuchs, Vice President Hot Rolling Mills and Plate Rolling Mills, SMS group

and a decreasing cooling effect on the strip. The nozzle rotation eliminates the need for overlapping spray patterns. Flatness deviations can also be easily handled. A conventionally designed finishing mill descaler has eight pumps, requiring 4,480 kW of pump power. Since the PIROSCALE® uses only half of that, this results in a specific energy consumption of 50 % only.

Smart descaling takes place in the roughing and the finishing mill area. The patented smart descaling means width- and steel-grade-dependent descaling. The water pressure and volume are precisely controlled and applied, saving water and energy use.

The coilbox between the roughing stand and the finishing mill of a hot rolling mill forms transfer bars into coils. During uncoiling, the former transfer bar tail runs into the finishing mill as the transfer bar head. The coilbox can be provided for new hot strip mills and modernizing the finishing mill entry section. Drawing on the experience gained from supplying more than half of all coilboxes built worldwide – including the very first mandrel-less device – SMS group has developed highly efficient strategies, including the ability to install them in an existing facility causing only minimal downtime.

The patented mandrel-less transfer of the coil from the coiling to the uncoiling station prevents the inner windings from cooling down. The latest-generation coilbox minimizes the temperature losses of the transfer bars even more. Also new are adjustable heat-insulating panels, for which a patent application has been filed. They reduce the heat radiation and, therefore, the temperature loss of the wound coil. The optimized coilbox geometry allows higher coiling speeds, so the transfer bars leave the roller table faster. A coilbox with transfer mandrels can be revamped to incorporate all the benefits of a mandrel-less device.

BENEFITS OF COILBOX

— Energy savings: up to 8.0 GWh/year
— CO_2 reduction: up to 4,000 t/year
— OPEX savings: up to 800,000 €/year

Heat panels reduce the heat radiation that causes temperature losses along the transfer bar length. Using the HI_{BOX} heat panels makes the finishing train's rolling behavior more stable, and the product mix can be shifted toward smaller final thicknesses and/or higher-strength steel grades. The heat panels are arranged as swiveling elements above the delay roller table, allowing simplified inspection and maintenance of the elements. Within each panel, the insulating elements are formed as individual modules. They are mounted on the panel and can be changed individually for maintenance.

BENEFITS OF HIBOX

— Energy savings: up to 5.0 GWh/year
— CO_2 reduction: up to 2,500 t/year
— OPEX savings: up to 475,000 €/year

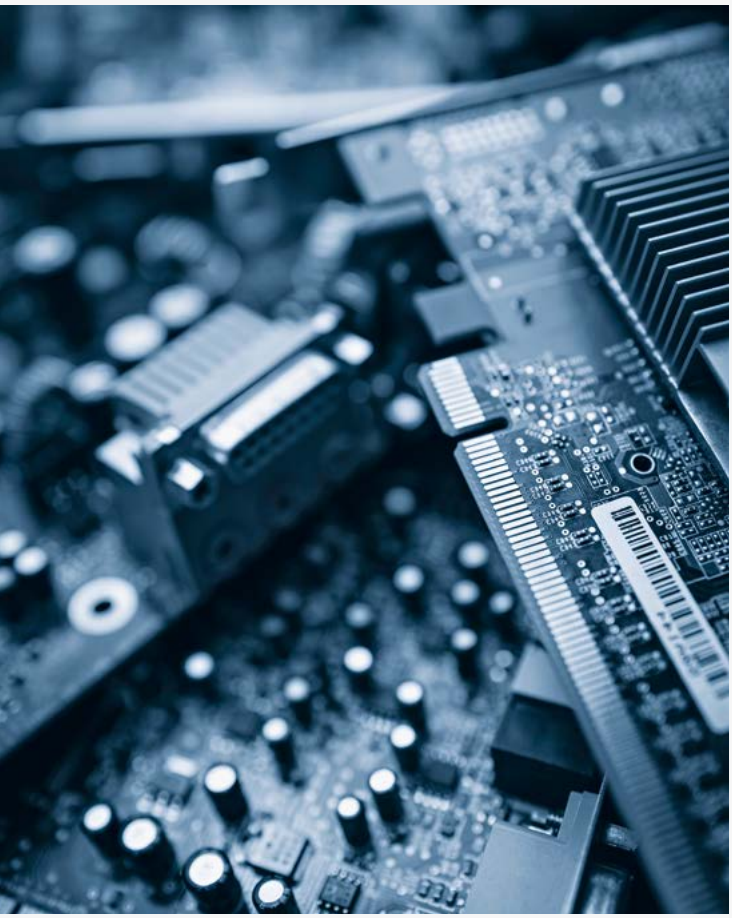
A conventional work roll spray cooling system installed in a 7-stand finishing mill mostly operates at a system pressure of 12 bar and uses approximately 7,000 m^3 of water per hour. The operational costs for energy, water use, and spare parts for nozzles and valves are significant. Instead of nozzle usage, the solution of the Convection Roll Cooling (CRC) is to form a water stream channel close to the work roll surface, which is cooled via the forced convection principle. Compared to a conventional spray cooling, the required pump energy is lower, due to the reduced pressure level. Furthermore, water guidance is simplified, and other mill areas are nearly dry. Up to 80 % savings in energy use for the pumps are possible, resulting in reduced OPEX of roughly one million euros per year. Other benefits are lower CAPEX at the water treatment plant and improved stripper stability, leading to less water leakage on the strip.

BENEFITS OF CONVECTION ROLL COOLING (CRC)

— Energy savings: up to 13.0 GWh/year
— CO_2 reduction: up to 4,000 t/year
— OPEX savings: up to 1 million €/year

Fume treatment for electrical and electronic equipment recycling





Photos: Getty Images/Adam Smigielski, Getty Images/Irina Marwan (top)

Fume treatment plays a vital role in the recycling process of waste electrical and electronic equipment as it removes harmful pollutants from the exhaust air. Combining highly developed technology and the right metallurgical process design and configuration produces the best results.

The push towards reducing our global carbon footprint and employing circular material use systems calls for innovative recycling solutions to process varying input materials and taking advantage of new processing routes. Recycling waste electrical and electronic equipment (WEEE) often involves a combination of pyrometallurgical and hydrometallurgical processes. The correct translation of different input materials and metals into the right metallurgical process and equipment can substantially impact how they are recovered as metals rather than being lost in off-gas or slag.

WEEE fume treatment challenges

Using recycled material in a metallurgical process results in a much lower quality of input materials and a wide range of harmful substances in the off-gas. Typical impurities that need to be treated in a fume treatment plant during the WEEE recycling process include sulfur compounds, chlorine compounds, halogen gas compounds, dioxins, CO, NOx, mercury, water, dust, and many more.

In contrast to traditional fume treatment systems comprising only one or two fume treatment steps, fume treatment for WEEE recycling entails combining different cleaning technologies. Each of the furnace process steps and the fumes and pollutants produced is fundamentally different and requires specific technologies for removal. However, the challenge is not only to reduce harmful emissions, but also to protect the fume treatment equipment from the impurities that may damage it, shorten its lifetime, or affect its fume treatment efficiency. Consequently, we must examine different fume treatment combinations to find the most cost-effective and environmentally efficient method. All our cleaning systems are designed to be flexible, consisting of different modules that can be exchanged or defined depending on the planned charge mix.

The result is an all-encompassing fume treatment plant that combines various technologies to minimize environmental impact and run the plant as efficiently as possible. Energy recovery is also a part of fume treatment systems and is becoming more and more relevant due to rising energy costs.

Fume treatment and furnace technologies are interdependent

Our fume treatment plants are designed in tandem with the connected furnace technologies so that specific fume treatment steps can already be performed via efficient furnace control. The furnace process is also partly controlled by the fume treatment plant. For example, the NOx emissions can be reduced through gas cleaning. But they can also be reduced

Typical gas cleaning steps for fume treatment plants in metal recycling

Post-combustion chamber
The post-combustion chamber ensures the complete combustion of the off-gas generated in the furnace. The gas temperature in the POC is controlled by injecting combustion air.

Energy recovery system
Instead of a post-combustion chamber, the fume treatment plant can be combined with an energy recovery system, which generates steam and produces relatively low off-gas volumes.

Selective non-catalytic reduction unit (SNCR)
Selective non-catalytic reduction (SNCR) has been used extensively to attain high NOx emission reductions by injecting a urea solution into the post-combustion chamber.

Selective catalytic reduction unit (SCR)
In some cases, a lower level of NOx output is required, depending on local regulations and the NOx production process already in place. That can be achieved with an SCR unit that works at lower temperatures and reduces NOx emissions to a lower level than the SNCR.

Quench
The quench works like an evaporative cooler system, where a fine water spray is injected into the off-gas inside the quenching tower and cools down the off-gas.

Bag filter unit
The filter house is one of the last fume treatment steps, separating any remaining dust. The filter area is chosen according to the required emission limits. A dust content down to 1 mg/Nm³ is achievable with SMS group's baghouse filter technology.

Scrubber unit
The scrubber unit absorbs gaseous inorganic components such as sulfur dioxide, hydrogen chloride, chlorine, and hydrogen fluoride.

Activated carbon / sodium bicarbonate injection
Depending on the local resources and existing facilities, a wet gas treatment solution can sometimes be avoided by injecting materials such as activated carbon or sodium bicarbonate.

X-Pact® Fume Treatment Assist
Our range of fume treatment technologies is rounded off by the X-Pact® Fume Treatment Assist. It is an intelligent calculation module that optimizes fume treatment quality, thereby reducing energy needs. The module is easy to retrofit, and offers significant advantages for revamp or upgrade projects. Energy cost savings of 21 % for an existing plant were demonstrated in a before-and-after comparison.

in a prior step by running the furnace in a way that minimizes NOx forming without compromising optimal metallurgical conditions.Removing the limitations between WEEE and the fume treatment plant leads to smoother operation and optimized results in terms of both the product and the related emissions.

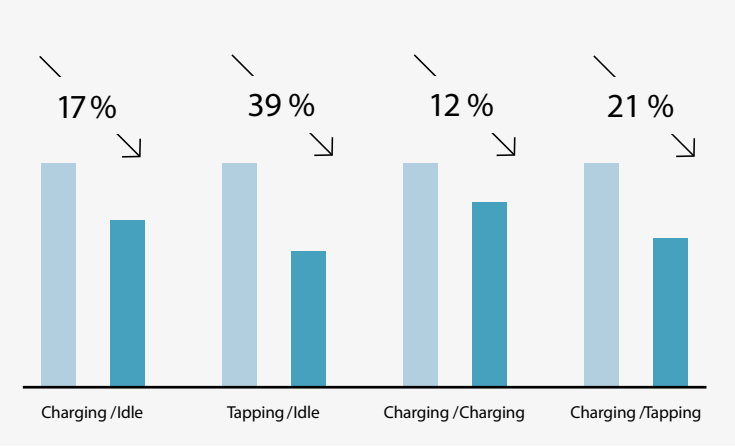
The right solution every time

Off-gas composition differs largely depending on the process and the charge mix in the furnace. Based on years of experience developing furnace processes and the downstream fume treatment process, SMS group's expertise covers a wide range of existing plants and the necessary data from tests to accurately determine the gas compositions for all charge mixes. The fact that the furnace and the fume treatment plant were both developed by SMS group gives us in-depth knowledge and control over the entire process. Furthermore, we consider local conditions in determining the best solution for each application. Factors such as the availability of local resources play an important role in choosing the appropriate fume treatment technology. For example, if water is scarce, a dry solution may be selected instead of a wet fume treatment alternative. Another example of local conditions to consider is the capability to recycle the dust that is filtered in the fume treatment plant. If that is an option, SMS group offers various solutions to recover valuable dust by sending it back to the furnace or storing it in some form. The fume treatment plant can also include measures to concentrate the valuable materials in the dust to the desired level by means of accumulation.

With years of experience developing such solutions, we also advise our customers on environmental regulations and the required solutions to acquire environmental permits while considering all the surrounding factors.

In addition, SMS group offers a wide variety of digital solutions for optimizing processes and monitoring emissions. These assist our clients in planning their production schedule in a way that considers charge material costs and market conditions and records the resulting carbon footprint for the relevant product. ●

Typical savings achieved by X-Pact® Fume Treatment Assist





Fume treatment plant



Life cycle

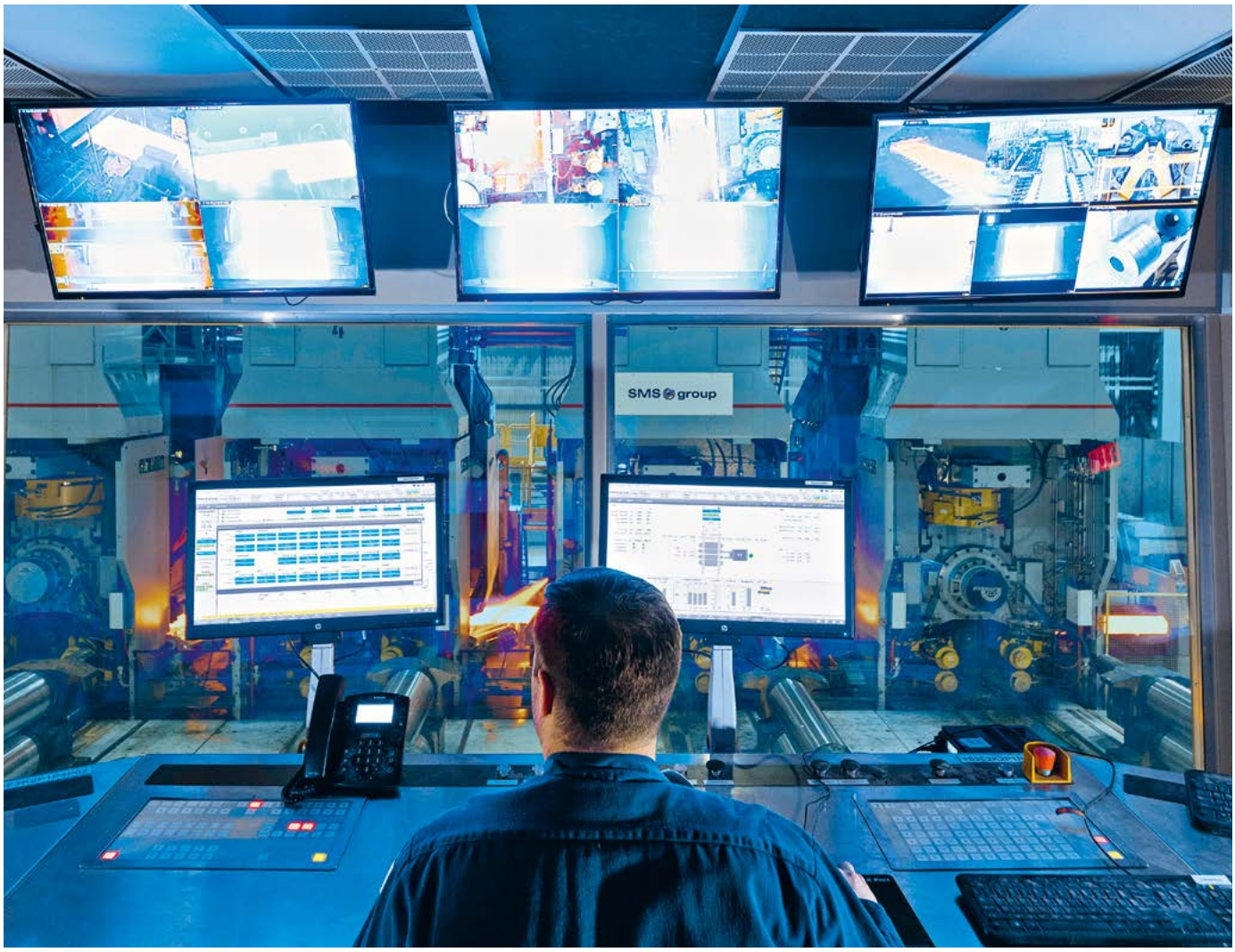


partnership

Automation: always evolving

SMS automation systems take an integrated, holistic approach that combines services, open standards, and the learning process over the entire life cycle of a plant. Additional services and new customer-focused business models complement our X-Pact® (Process Automation Control Technology) solutions to improve and enhance automation systems throughout their whole life cycle continually.

Control station of
a CSP® mill





The complex nature of the steelmaking process, an ever-changing process automation technology landscape, and the continuously evolving requirements of markets and customers make one thing very clear: The plant automation systems must be continually updated and able to learn from and adapt to their environment.

In addition to its ongoing functionality improvements, typical challenges for automation systems today are:

— Security and operation system updates
— Database maintenance and supervision in Level 2
— Control of the communication between different levels and apps
— Gaps in automation performance due to new grades or materials
— Unexpected impacts of changes in the software
— Wear-and-tear impact of the mechatronic behavior and related process improvements.

Our software design addresses these challenges. X-Pact® automation focuses on holism, openness, and learning. Gerald Mayr, Executive Vice President of Electrics/Automation at SMS group, stands firmly behind this approach. "We take responsibility for our automation systems over the entire plant life cycle. Along with the main focus on process guidance for operation and control, our innovative, structured, and →

"High-performance automation is not limited to the system expertise and architecture. It is more about the additional services for performance improvements throughout the plant life cycle."

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



X-Pact® automation cabinets

modularized Level 1 and Level 2 software architecture facilitates multi-directional connectivity. This results in a digital-ready delivery enabling the complete world of digitalization without additional efforts."

Openness: Vital for connectivity

Modular software architecture is essential here. SMS group combines its modules with open-source and third-party products to provide application openness and eliminate dependency on a single supplier. Using state-of-the-art software and development tools, SMS group implements international standards in its innovative, structured, and modularized software architecture in Level 1 and Level 2. The system design focuses on consistent version management and integrating testing. Individual update processes and procedures for each delivery can be pretested in-house during X-Pact® Plug & Work integration testing that SMS group runs for each project long before on-site installation.

Gerald Mayr explains: "Thanks to our process guidance approach, we have standard interfaces in our models for Level 2 and above via a communication adapter. Like a travel plug adapter, we offer all state-of-the-art communication protocols without interfering with the application's kernel. This means that whatever our customers select, we can connect without any additional integration effort. We have the same approach for databases: Our application connects to any customer database – including open-source products like Maria DB or licensed products like Oracle. We simply plug in."

Additionally, SMS group has developed different software layers to stabilize real-time performance. With this approach, the system can reply to requests much faster than before to guarantee flawless production performance.

Learning: Thanks to digital readiness

All SMS plants come digital-ready, with all machine and automation data described in contextual meta-information in a standardized format via supported interface technologies. With SMS DataFactory, these data can be gathered centrally and, thanks to the harmonized description, made easily accessible for all digital solutions. The content and the data genealogy are reduced to one interface for apps without any impact on system performance in Levels 1 and 2.

SMS group facilitates Level 2 and Level 1 version control and delivery documentation for our software products via our in-house competence center. A team of experts is responsible for keeping libraries up to date and meeting the challenging quality standards before release. Improvements based on feedback from customers and our experts, mainly during the start-up phase (e.g. HMI faceplates), are crucial for delivering updates without changing the core functionality of the individual application. By strictly defined hierarchical software design in the Level 1 according to functional layer modeling, the updates have to be done only in the lower hierarchy level. At the same time,

process improvements happen in the upper part of the software architecture.

Based on the functional layer principle, different functionalities like sequencing and technology control are allocated to different layers. Gerald Mayr explains what that means for process improvements: "Based on what our customers need, we can enable them to make their own changes in the sequencing layer. However, technology controls are a different story. They are very complex, have high real-time demands, and have a high potential for negative impacts across all levels when altered by inexperienced personnel. That's why we offer our customers process improvements in a SaaS (Software as a Service) model by connecting to our own optimization apps, AI modules, or those from third parties. Our strategy is to eliminate the borders between Level 1 and Level 2 by encapsulating the technology control in a highly real-time demanding controller environment as SaaS on-premises. This allows our customers to focus on the production sequences and use the control as an intelligent "gray box" maintained by SMS experts. Nowadays, technological control systems (TCS) present a huge opportunity to adapt to customer needs via outside configuration while keeping the core stable. Connectivity and open interfaces are key. While we prefer our solutions, we are not afraid of the know-how of others. For us, this is competition. Thanks to the openness, a customer could run two models in parallel and evaluate the performance of each."

Due to hundreds of combinations with thousands of different set points are possible in technological control, the customer benefits for such a "gray box" solution are numerous:

— Customers select the right strategy (for example off gauge length or maximum speed) based on material and yield results and get a properly tuned TCS automatically via an intuitive simplified HMI interface.
— Customers can change the strategy on time without taking care of the controller set points details.
— Background optimization of the set points based on a combination of the selected strategies.
— Customers are free to connect to other providers they want to work with based on the open connectivity interface.

Holism: New EaaS/SaaS operational readiness solution

In an exciting new development, SMS group is preparing to introduce a more far-reaching approach. All of the capabilities mentioned above like updates, connectivity, openness, performance improvements, security, and maintenance, could be parts of a new "all-inclusive" solution for "operational readiness". Combining all these efforts with SMS group's 24/7 services, this approach represents a new direction in which SMS group wants to go in order to guarantee system performance stability and availability. By combining EaaS (Equipment as a Service) and SaaS on-premise, plant owners will be able to focus exclusively on operations. In an automotive context, we would call it "readiness to drive". For an automation system, we call it "operational readiness" it will mean:

— Backup done
— Licenses and certificates are up to date
— Latest version of software applied
— Security regularly checked, no virus or malware
— Databases cleaned and not locked
— Controller, switches, and devices are running
— System ready and available for operation

Gerald Mayr sums up: "With our new concept of operational readiness, we allow customers to focus exclusively on operation. Everything else is taken care of by us." ●



DIGITAL READY

Digital readiness is essential for making production units, equipment, devices, automation systems, or any other element ready for digitalization with minimal effort. It means that by providing documented access to data, existing and future software solutions and models can easily be integrated. If an element is digital-ready, its machine and automation data is described via contextual information (metadata), and its data access information is published in a standardized fashion via all supported interface technologies.



See the Leading Partner Talk with Gerald Mayr at Aluminium trade fair:

Expert teams to decarbonize long products mills

Reduction of energy consumption and carbon emissions can only be achieved with a holistic view of energy-saving measures, automation optimization, and sustainable technology innovations. That's why SMS group has put together expert teams from all domains to develop tailor-made modernization concepts for existing mills to integrate an end-to-end perspective with our customers.



Thomas Maßmann is Executive Vice President Long Products.



Thiago Turchetti Maia is Head of SMS digital.



Bodo Falkenhahn is Vice President Electrics/ Automation Long Products.



Marc Hamacher is Vice President Service Long Products.

In that context, we looked specifically at optimization opportunities for long products rolling mills. We talked to our specialists for digitalization, service, electrics, automation, and plant technology to explore the combined competencies for maximizing sustainable plant potential.

Mr Maßmann, the Green Deal again tightened the European guidelines for CO_2 savings in the steel industry last year. It means that reducing the CO_2 footprint concerns steel producers, their customers, and consumers. Have you already experienced any increased interest in sustainability solutions among long-term customers?

Thomas Maßmann — Yes, this is a recurring topic in customer meetings. Of course, reducing operating costs always plays a role, but lowering the CO_2 footprint of the rolling mill is discussed at the same time. Furthermore, we learned that especially their customers in the automotive and construction sectors want to claim a low CO_2 footprint for the final product.

Besides, the political guidelines and CO_2 certificates, based on the emissions trading system in Europe, are also recurring drivers for the optimization of rolling mills. That is also an important topic for our international customers who export their products to Europe.

That raises the question of where exactly in the rolling mill process emissions are to be improved.

TM — Generally, CO_2 emissions arise along the entire process chain and always vary due to location factors. The primary emission source in rolling mills is the reheating furnace, which traditionally runs on fossil fuels. Electricity comes in second. Here, it depends on whether power was generated from renewable sources.

Only an on-site technical inspection can provide accurate information on all emission sources. Our integrated on-site assessments support our customers in reducing emissions and meeting individual plant operation KPIs.

Which KPIs do you examine as part of the assessment?

TM — On-site assessments are primarily carried out based on optimization requests from customers to achieve higher plant efficiency and are not limited to energy and emission reductions. In this context, KPIs would be about reducing operating costs through optimization measures.

Regarding the political requirements for emission reduction, it is important to know that sustainable plant optimization is not a compromise for our customers. It usually goes hand in hand with increasing energy efficiency and reducing operating costs. Therefore, energy reduction and fossil fuel savings are essential KPIs and will guide a specific energy efficiency on-site assessment. Since the emission sources can occur along the entire process chain, and optimization of the mechanics alone is insufficient in this case, we are bundling our internal synergies from digitalization, technical service, electrics/automation, and mechanical systems.

Mr Maia, you have been involved in these kind of assessments before. How do you assemble the team for such sustainability and energy-saving on-site assessments?

Thiago Turchetti Maia — We choose the teams for the usual energy on-site assessments based on individual site conditions. For example, the energy matrix and operations characteristics of an integrated site are different from a minimill. We usually send members of our engineering, operational intelligence, and digitalization teams, who all deal with energy management and optimization from different perspectives, to leverage a plant's total energy savings potential.

For sustainability optimization concepts, we rely on multidisciplinary teams, as Thomas Maßmann already mentioned. The specialists are chosen based on the competencies required by our integrated assessment and consulting team, considering a holistic view of the rolling mill. Based on this expertise, we examine the individual rolling mill for optimization potentials concerning mechanics, automation, energy reduction, and asset condition.

How does this team examine the rolling mill in the on-site assessment in terms of emission savings, and how are the agreed-upon KPIs examined?

TTM — The team primarily aims to inspect the entire rolling mill and its machinery and monitor all operating parameters. That's how they identify areas of inefficient resource management and emission sources. The team identifies focus areas with a high potential for meeting the defined KPIs. Here, the synergy effects from the different departments are essential, and a more detailed investigation is performed for effective optimization measures in the focus areas. →

> "Only an on-site technical inspection can provide accurate information on all emission sources."
>
> — Thomas Maßmann

Does that mean the identified focus areas are subsequently analyzed in depth?

TTM — Exactly. We call this phase the deep dive analysis. We'll quantitatively examine the individual focus areas for measures to achieve the KPIs and reduce the emission sources.

The goal is to provide our customers with actionable recommendations that consider individual requirements and budgets. In doing so, we pursue two different approaches to action:

— The first deals with improving rolling mill operations without changing equipment.
— The second deals with improving rolling mill operation by modernization or installing new equipment. For the second approach, we can offer complete product and service solutions from a single source.

Based on the individual measures of these two action scenarios, we determine the total savings potential and communicate it to the customer.

Mr Maia and Mr Falkenhahn, digital and electrics and automation concepts usually go hand in hand. Based on the suggestions from the first approach to action, where could energy and, thus, emissions savings be optimized in the process flow?

Bodo Falkenhahn — The process flow in the rolling mill can become more energy efficient and sustainable without changing the equipment. We can reduce emissions, operating costs, and energy consumption through optimized production-related deactivating of unused equipment and intelligent control concepts. In terms of emission savings, we can realize the most significant savings potential in reheating furnaces. SMS-Prometheus® is a combustion optimization system that can efficiently reduce fossil fuel use during production and save energy also in non-productive periods.

TTM — We can achieve energy savings in different ways, from fine tuning of process parameters with digital models, to optimizing production planning. A good example is the energy consumption in fluid systems, such as hydraulic pumps. These pumps are in operation all the time, even when there is no demand in the production process. In idle mode, the pumps and their electric motors also consume energy. That's an example of hidden energy-savings potential, and the common go-to solution is the use of variable-speed drives. As effective as these drives may be, however, they can also be misused given the properties of the pump-motor sets and their combination in pumping stations. We have seen situations where the wrong use of drives actually increased consumption! To manage this, we rely on digital models that replicate specific behavior of these pumping assets and optimize the use of variable-speed drives to achieve a certain combination of flow rate and pressure in the most efficient way possible. At the other end of the spectrum, effective process and material flow planning can prevent inefficient energy consumption during production gaps. Reheating furnaces, for example, may be optimized to conserve their temperatures during these gaps, reducing the time required and the cost of restarts. The same is applicable for various other types of equipment.

Mr Hamacher, you are responsible for technical service for long products rolling mills at SMS group. How do you see it from the technical service perspective? Where can emissions be saved in the first approach to action?

Marc Hamacher — Many people do not consider that the restart of a plant after unplanned downtime due to worn spare parts is a source of energy consumption. To counteract such downtimes, the concept of breakdown prevention is helpful. With Genius CM®, SMS group offers a modular online screening system that uses sensors to continuously monitor the condition of machine components. It continuously sends information about the condition of components, their early-required replacement, and notifies when a component will be so worn that it could cause an unplanned downtime. In on-site assessments, condition monitoring can happen via mobile sensors or be installed as a permanent solution.

"We can realize the most significant savings potential in reheating furnaces with SMSPrometheus."

— Bodo Falkenhahn

"Energy consumption is efficiently and automatically controlled and emissions are reduced permanently."

—Thiago Turchetti Maia

These are all measures to reduce energy consumption without changing the equipment. But which products could we offer to further reduce the carbon footprint of long products rolling mills?

TM—In addition to SMSPrometheus®, mentioned by Bodo Falkenhahn, SMS offers a portfolio of different burners for reheating furnaces that can deliver fuel flexibility and reduce NO_x emissions. To address the decarbonization targets of the industry, we can already offer emission-free solutions. The SMS-ZEROFLAME HY2 burner can be operated with a mixture of hydrogen and natural gas. Of course, it can also run on 100 % hydrogen. This flexibility allows our customers to gradually transition to the hydrogen economy. The SMS-ZEROFLAME HY2 can also be installed in existing plants after testing by an expert on-site.

Mr Maia, which digital solutions can optimize existing equipment and support sustainable production processes in rolling mills?

TTM—From a digital point of view, we can offer systems to track the total energy consumption of the rolling mill and automatically define energy-saving capacities. We have an entire family of digital products suitable to optimize rolling mills in the Viridis Energy & Sustainability Suite. Energy consumption is efficiently and automatically controlled and emissions are reduced permanently.

Mr Hamacher, looking back on this conversation, how would you summarize the benefits of your long products technical service team's cross-functional know-how for the upcoming modernization phase?

MH—We cannot meet climate targets and political regulations by only modernizing machines, we also have to look at production processes and planned downtimes to identify all sources of emissions. Only a cross-functional perspective can exploit the full potential of rolling mill sustainability. It is important to understand that there is no one-size-fits-all solution for modernization and that each rolling mill has to be assessed individually to decide which of the above technologies will help to achieve its KPIs. In this context, the great benefit is that we can internally synergize expertise and take an end-to-end perspective with our customers. ●

"We counteract unplanned downtimes with condition monitoring."

—Marc Hamacher

Our worldwide service centers

Our more than 30 service centers around the world play a crucial role in our concept of 'Life cycle partnership'. This well-connected service network means we can respond quickly and offer rapid support for all the challenges you face. Wherever your plant is, you can be sure we are close by to guarantee fast reaction times and meet your needs.

USA

With our twenty locations in the United States, we offer comprehensive maintenance and spare parts for metals production, continuous casting, flat rolling (hot and cold), long products, tube and pipe, forging, non-ferrous technology, and heat treatment plants – all from a single source. Apart from traditional refurbishment services for all major OEM equipment, our customers can also take advantage of our wide-ranging field services and modernization projects.

LOCATIONS
Twenty service centers close to our major customers, from Gary (Indiana) to Mobile (Alabama), from Pittsburgh (Pennsylvania) to Davenport (Iowa)

HIGHLIGHT
Comprehensive long-term maintenance and spare part services along the complete process chain







Our service centers in the US, China, Germany, and India

BRAZIL

Under the roof of SMS group and Paul Wurth, we serve customers in Brazil and South America with more than 500 employees and five service centers.

LOCATIONS
Five service workshops in Vespasiano (Minas Gerais), Serra (Espírito Santo), Santana de Parnaíba (São Paulo), and Sertãozinho (São Paulo)

HIGHLIGHT
Diagnoses, modernizations and repairs, field service, engineering and manufacturing of equipment, basic or detailed conceptual engineering, technical support, supply of spare parts, technical maintenance services





GERMANY

Our service workshops in Mönchengladbach and Hilchenbach are part of Europe's most modern heavy-machinery manufacturing sites. They play a crucial role for modernization, maintenance, and repair. The service centers are specialized in helping customers quickly and flexibly with planned and unplanned plant shutdowns. Our specialists manufacture new spare parts, repair and overhaul machine assemblies, and modernize complete machines.

LOCATIONS
Two service workshops in Mönchengladbach and Hilchenbach as part of our manufacturing operations with a total of 80,000 m²

HIGHLIGHT
Specially developed repair concepts and processes with the aim of minimizing throughput times, reducing costs and enabling machines and systems to be returned to their original condition as quickly as possible.

ITALY

Our Italian service centers represent the perfect blend of expertise and flexibility on several products, giving customers a solid partnership on plant efficiency and utilization through an extensive range of service products. The setup benefits from the background and process know-how of a strong tailor-made business consolidated around the world through the years, with a high degree of harmonization to the after sales business.

LOCATIONS
Two service centers in Tarcento (6,300 m²) and Treviolo (2,500 m²)

HIGHLIGHT
Core assemblies, technical expertise and refurbishment for metallurgy, flat and long products.

INDIA

To expand our base in the India and Asia Pacific market, we have built a manufacturing and service workshop in Khordha/Bhubaneswar in 2014. This workshop is located close to a highway, international airport, and marine port. 70 % of our Indian prospective customer's plants are located within 300 km from this workshop. In 2025, we will open a second service center in the state of Gujarat.

LOCATIONS
Khordha/Bhubaneswar with 21,000 m² workshop area

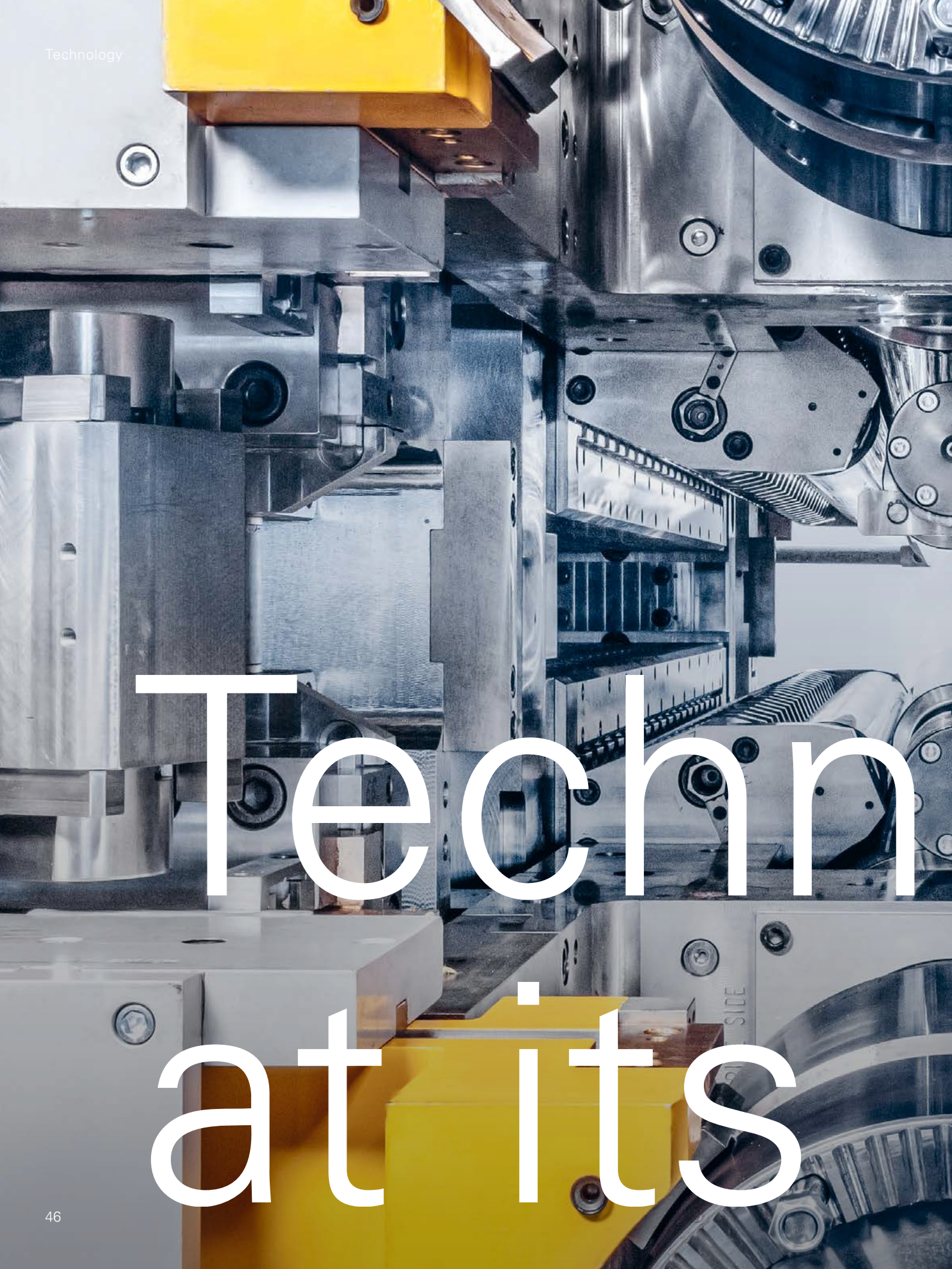
HIGHLIGHT
Repair of caster (reconditioning and repair of continuous caster molds) and rolling mill core components (mandrels, spindles, AGC cylinders, CVC® blocks, rolls, chocks, and more)

CHINA

To provide Chinese customers with life cycle services, we have established two service centers in Shanghai (26,000 m²) and Tianjin (14,500 m²). Included in the service portfolio are solutions ranging from spare parts to repairs and modernization, technical support, warehousing, consignment stock, teleservice, training sessions, and electrical and automation systems implementation.

LOCATIONS
Two service centers in Shanghai and Tianjin

HIGHLIGHT
Comprehensive maintenance and spare part services along the complete process chain



Techn
at its



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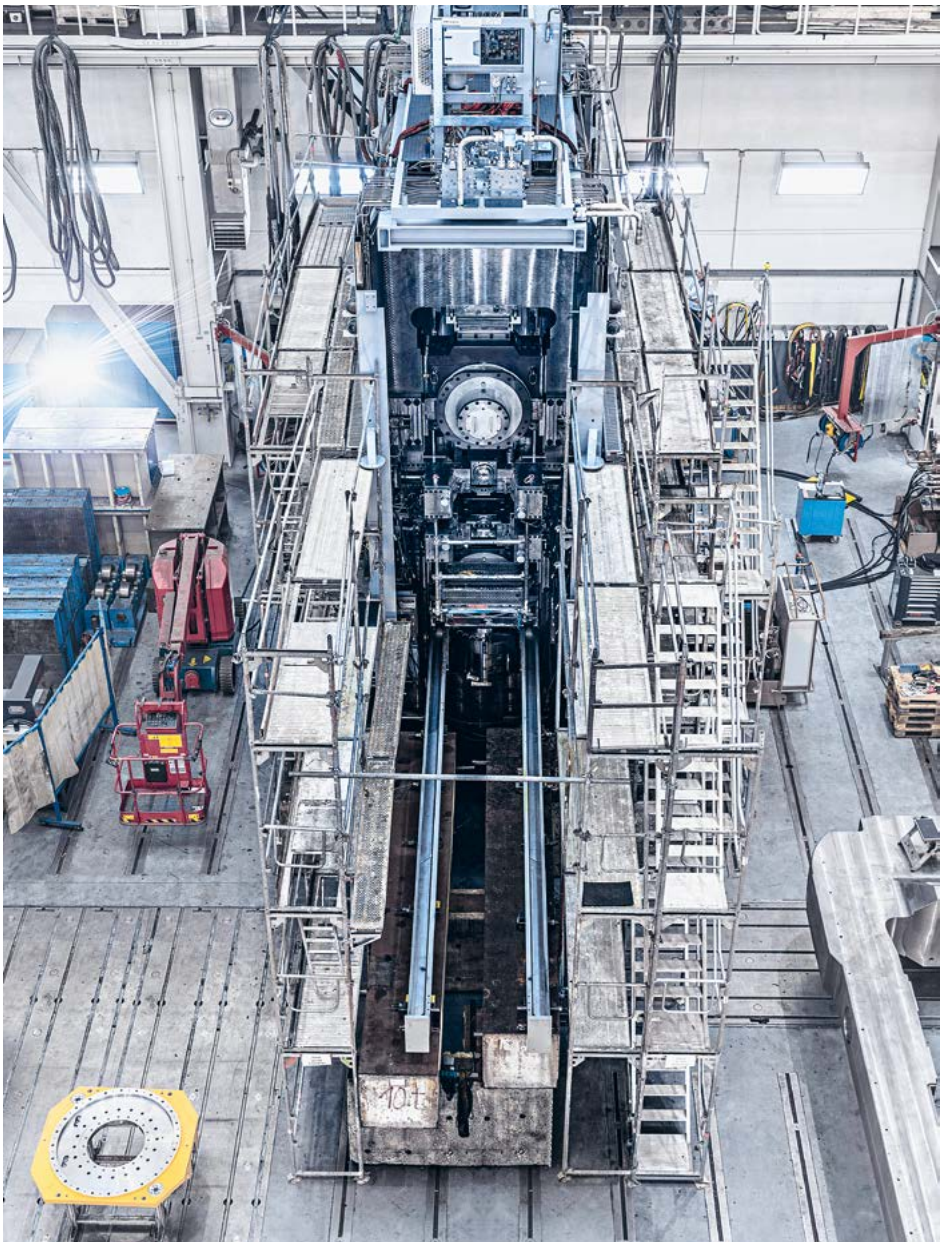
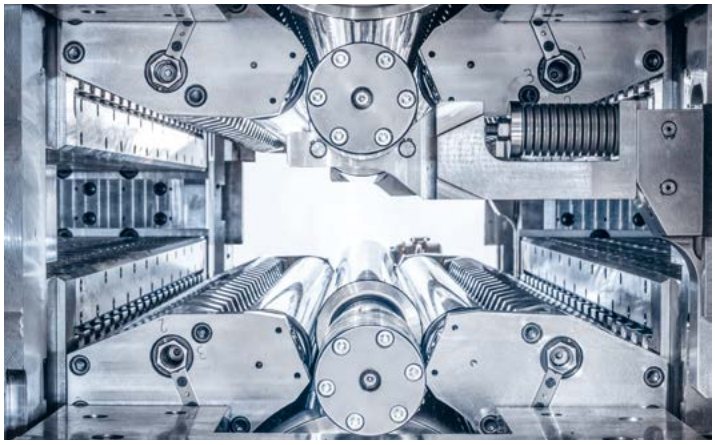
best

The world's first Multipurpose Mill

The X-Roll® Multipurpose Mill (MPM) is a revolutionary new concept for cold rolling and allows the flexible production of soft and high-strength materials on a single mill stand. SMS group supplies the first MPM to Big River Steel.



Pre-assembled X-Roll® Multipurpose Mill at SMS group workshop



View into the roll gap with 18-HS equipment

The X-Roll® Multipurpose Mill is an extremely flexible and revolutionary plant concept that will influence the future of engineering and construction of cold rolling mills. The MPM enables Big River Steel (BRS) to roll an extremely wide range of material grades with the same mill – an ambitious process considering that the range of rollable grades varies from very soft carbon steels (IF grades) to ultra-high-strength steels and stainless steel. In addition, the MPM provides optimum preconditions for particularly challenging steel grades such as silicon steels. BRS will use the MPM mainly for the rolling of low-alloy carbon steels as well as grain-oriented and non-grain-oriented silicon steels.

Mill stand concept for 4-hi and 18-hi mode

At first glance, the Multipurpose Mill concept is a single-stand reversing cold mill (RCM) with the well-known main equipment: a pay-off reel, belt wrappers, tension reels, the mill stand and the exit-side belt wrapper for gentle coiling of the finish-rolled strip. Its unique feature is that it can be operated with two different arrangements as four-high stand (4-hi) and as a 18-HS multi-roll (18-hi) stand.

How does that work? The work rolls with their associated equipment are each arranged in cassettes. In 4-hi mode, the cassette contains the necessary chock with the work roll. In 18-hi mode, the cassette – in addition to the chocks – includes the intermediate roll and work roll, the side support rolls, and support bearings. This way, the roll change process just consists of the automatic cassette of cassettes, making it extremely efficient. The complete change of the rolls and of the rolling mode routine again takes a maximum of 6 minutes from start to being operational again.

As there is a risk of strip breakage when rolling silicon steels, a quick change of the roll assemblies is very beneficial and prevents downtimes. In both operating modes, an emulsion is used as a lubricant.

The cost advantages both in terms of CAPEX and OPEX are obvious. The alternative would be the operation of two different rolling mills, such as a conventional RCM in 4-hi or 6-hi design and a multi-roll mill in 20-roll or 18-HS design.

With the MPM, a wide range of materials can be rolled with only one mill. Using just one mill with a simplified roll-changing process between the two operating modes allows for maximum flexibility in production planning. Furthermore, the smart solution also reduces costs for maintenance as fewer spare parts have to be kept in stock.

Advanced rolling technology

The MPM for BRS is designed for a rollable strip width range from 850 to 1,650 mm. The narrowest work roll (18-HS mode) has a diameter of 120 mm, while the diameter of the thickest usable work roll (4-hi mode) is 450 mm. Using the thin work rolls in the 18-HS mode →

BIG RIVER STEEL

The Multipurpose Mill is part of SMS group's supply of the expansion of Big River Steel, USA, to 3.0 million t/year. In 2017, SMS group supplied the complete plant technology from electric steelmaking to CSP® plant and strip processing for this greenfield project. Due to the high level of digitalization, Big River Steel is considered the world's first Learning Steel Plant.



The project teams of SMS group and Big River Steel during a tour of the pre-assembled mill stand of the world's first X-Roll® Multipurpose Mill.

enables high pass reductions and the rolling of thin strips. At a strip speed of 800 m/min, the strip edge drop is minimized by lateral shifting of the intermediate rolls, thus increasing the yield.

Contrary to that, the 4-hi mode is used for a higher material thickness and runs with a strip speed of 1,000 m/min. The mill stand's bending system is suited for both modes: the work roll in 4-hi mode as well as for the intermediate roll in 18-HS mode. The same applies to the axial shifting system. Rolling a thin grain-oriented strip dimension with a high level of silicon necessitates a very small work roll which is available in the 18-HS mode. It enables BRS to roll strips with entry gauges of 0.6 to 2.5 mm on the MPM and to realize final gauges in the range of 1.5 to 0.18 mm.

Visit of Big River Steel experts

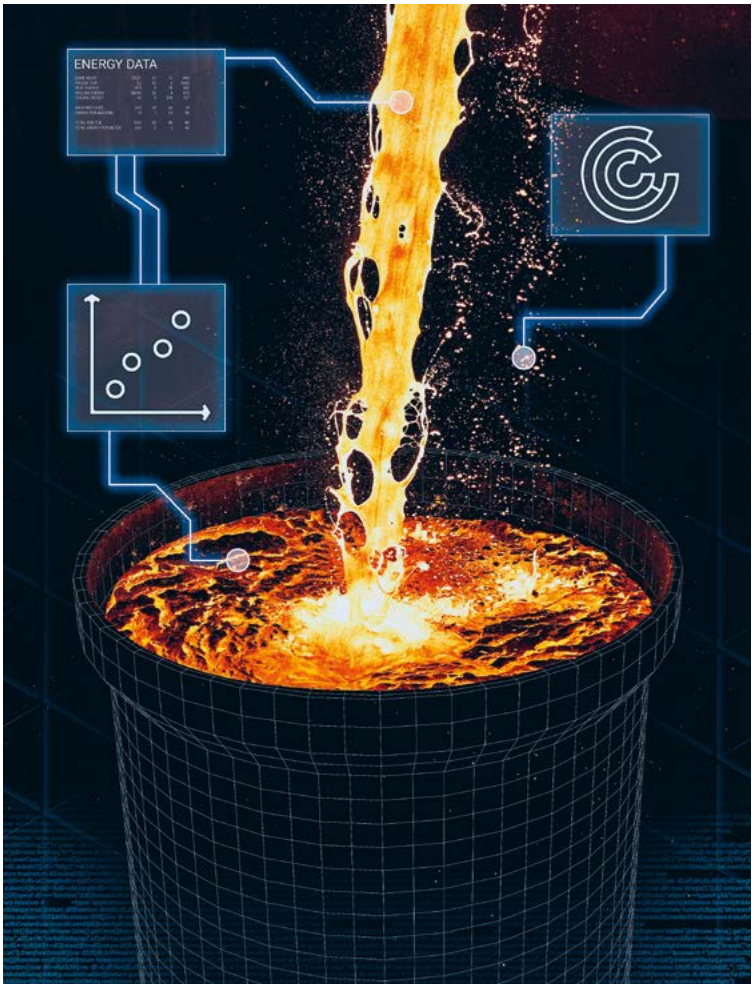
In September 2022, experts from BRS visited our Hilchenbach workshop to see the pre-assembled prototype of the new mill. A function and performance test proved that all mechanical mill functions and actuators such as locking, hydraulic gap control (HGC), roll balancing, roll bending, roll axial shifting, spindle head clamping, and pass line adjustment showed outstanding results. After pre-assembly and the completed functional test, the new mill was partially disassembled and shipped to Arkansas where the final assembly took place.

The hot commissioning with the rolling of the first cold strip is to take place in July 2023. ●

TECHNICAL FEATURE	FUNCTION	BENEFITS
CVC® PLUS TECHNOLOGY	Lateral shifting of work roll (4-hi mode)	— Work roll shifting technology for improved roll gap setting and thus optimal strip flatness — Equal load distribution between the rolls during rolling and thus reduced roll wear
EDGE DROP INFLUENCE	Lateral shifting of intermediate rolls (18-HS mode)	— Elimination of edge drop — Force relief at strip edge area reduces wear of work rolls
HS-SYSTEM	Horizontal stabilization	— To fix the position of work rolls — Strong side support beams to absorb high horizontal forces — To ensure stable rolling for all grades, especially challenging grades
MULTIZONE COOLING SYSTEM	Optimization of strip flatness (4-hi mode)	— Correction of higher-order flatness deviations
AUTOMATIC ROLL CHANGE	Fast roll and operation mode change	— Installation of intermediate, work, and side support rolls in removable change cartridge (cassette design) — Replacement of the complete cassettes — Reduction of non-productive times

Process modelling and twinning for metals

The design of plants for non-ferrous metals or multi-metal recycling is particularly complex due to the large number of elements that must be recovered. That's why we rely on digital twins with process simulations to design plants and metallurgical processes that perform as effectively and efficiently as possible.



SMS group uses flexible and intelligent software tools to address the enormous variety of elements and guarantee high recovery rates. These tools provide the basis for assessing the most effective metallurgical process with the most efficient equipment.

This means, that the the metallurgical processing of primary and secondary resources, such as scrap or residues, must be coupled to product design. The objective is to minimize the dissipation of materials, energy, and exergy while maintaining energy and material quality. The best way to accomplish that is to digitally twin the system with process simulators. Digital twins facilitate the integration of the thermodynamic and physical foundations that enable the evaluation of different energy mixes, such as hydrogen or syngas. In addition, digital twins offer a perfect platform for communicating with internal and external stakeholders based on the results of simulations with different parameters.

From business case to optimal process solution

Precise twinning of metallurgical equipment or a complete plant provides accurate data for defining operating costs, developing optimized processes and new product lines, obtaining detailed environmental impact data, and setting parameters for the plant and furnace design. Additionally, the process data define the technological solution and, therefore, the costs for the supplies and services for the →

main process equipment. These cost definitions are the basis for informed joint decision-making with our customers. Establishing the business case is an iterative process for which the digital twins are the calculation engines for determining optimal process solutions in terms of economics and the environmental footprint within operating windows boundaries.

Principles of metallurgical process simulation and process twinning

SMS group's steady-state and dynamic process models for complex metallurgical plants work on a Gibbs free-energy, split-factor, and reaction equation basis. We use software tools such as thermodynamic calculation, Gibbs minimizing calculation software, thermodynamic database systems, phase equilibria calculations, our own databases and software (BlueControl), or experiential data and reactor/system know-how. The models provide a solid basis for evaluating inventory data, which are then linked to environmental software for assessing any of 18 different environmental impact factor categories, including scope 1 to 3 CO_2-eq. emissions. The above figure shows the exergy flows of specific copper recycling and refining technologies as an example for estimating the actual losses from the system. A comparable plant was successfully commissioned for Aurus in 2021.

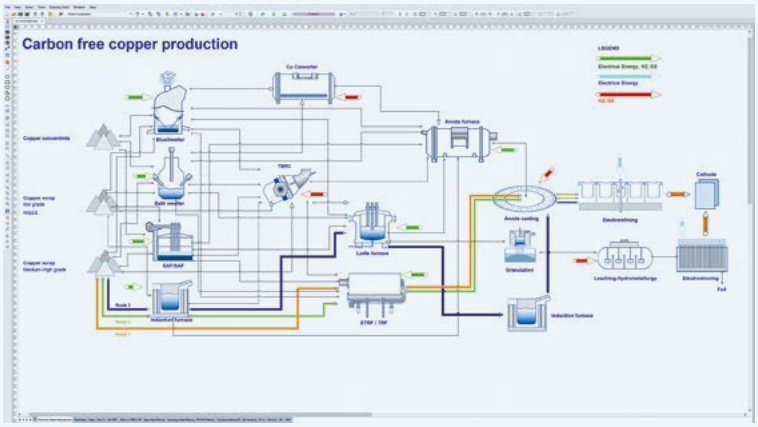
Success stories of digital twinning and metallurgical process design

SMS group successfully utilizes process twinning in iron and steel metallurgy, and to an even greater extent, in non-ferrous metal and ferroalloy production lines. Our main objectives for process twinning are:

— Achieving maximum overall plant performance and efficiency (both energy and exergy)
— Saving energy and resources while maintaining material and energy quality
— Realizing green and clean production lines
— Turning waste into products and energy to increase material quality
— Carbon-neutral metal production
— Digital, self-learning metallurgical plants
— Sustainable profitability

Best process design partner

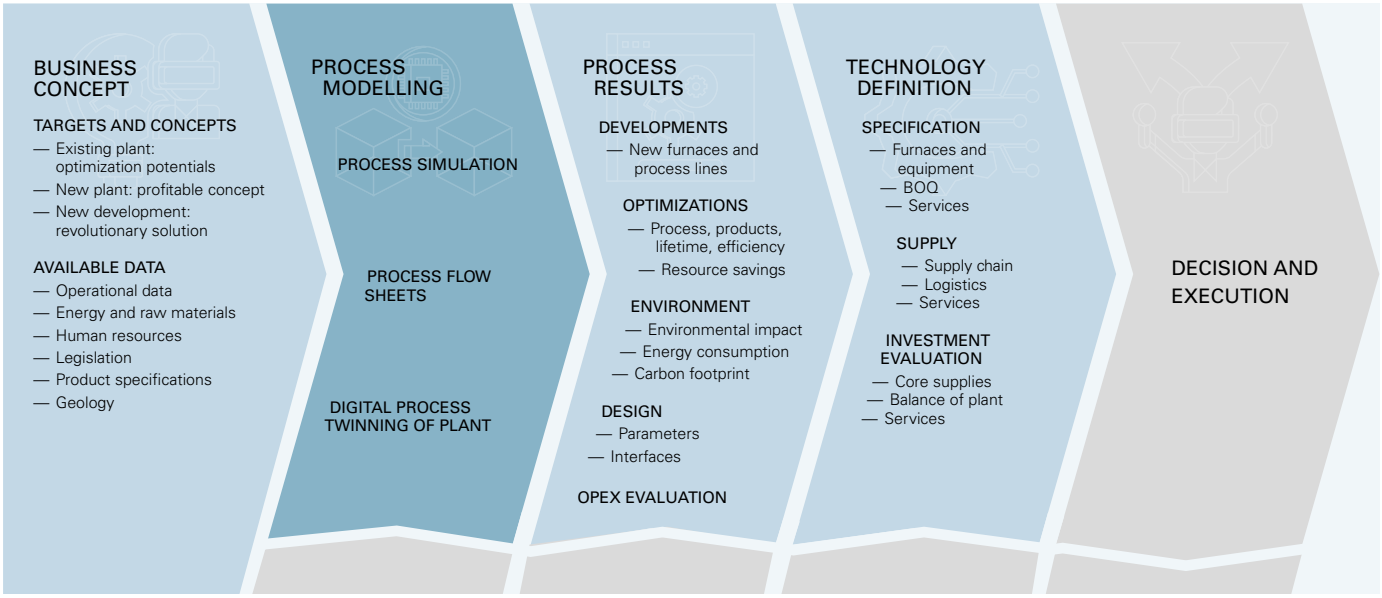
As an equipment and plant supplier with more than 150 years of experience in the metals industry, and extensive process and service expertise, we can offer a comprehensive range of complete solutions for the non-ferrous metals industry. Digital process twinning and process modelling are vital to achieving



Exergy flows of copper recycling and refining technologies in a plant

EXAMPLES FOR SUCCESSFUL DIGITAL TWINNING

PRODUCT	APPLICATIONS DEVELOPED WITH DIGITAL TWINNING
GREEN COPPER PRODUCTION	Detailed case study completed for first carbon-neutral copper production line for the Middle East region
BLUEMETALLURGY	Digital process twin for complete primary copper plant including calibration with the real data completed for a European client
BLUEMETALS – WEEE RECYCLING	WEEE (waste electrical and electronic equipment) recycling plant based on process twinning, now successfully in operation
BLUEFOIL	Worldwide first copper foil production line based on Cu scrap recycling under execution in Asia
BLUECAT	New recycling process for catalytic converters based on electric furnaces and TBRC (top-blown rotary converter) technology finally developed
COPPER SCRAP RECYCLING	High-efficiency copper scrap refining plant for the production of FRHC anode in operation in the U.S.
PEIRCE-SMITH CONVERTER	New type of PSC (Peirce-Smith converter) for Ni-matte production for a Korean client under execution
BLUESMELTER	New generation bath smelter with the highest process efficiency developed by using a digital process twin, process confirmed in a pilot plant in Sweden



From business concept to optimal process solution.

the desired goals. They involve gathering detailed process knowledge and industrial data in a mathematical structure consistent with the physics of the respective processes. SMS group relies on more than 500 metallurgists, process experts, mechanical engineers, researchers, automation specialists, digital experts, and many other specialists in different fields, as well as feedback from an array of successful projects.

BlueControl: first cutting-edge predictive online process control of complex metallurgical systems

SMS group has invested all its non-ferrous metal process expertise into its milestone BlueControl system – a predictive online first principles-based process control system. Developed in-house, this software enables the integration of deep-learning applications within Level 2 and 3 process control architectures.

SMS started with non-ferrous metal processes due to this sector's huge savings potential. There are two versions of BlueControl:

— The offline version can be used for operator training and calculating different operating conditions
— The deep-learning (AI) real-time version uses the data generated by the offline BlueControl version.

BlueControl allows to calculate:

— Tap to tap times and how to optimize them
— Fuel savings
— How to minimize flux additions as a function of anode copper quality
— How to optimize the product quality by using less expensive input materials
— How to extend the furnace lifetime
— How to accurately control emissions
— Cost savings

The next steps for BlueControl in the non-ferrous metals sector are:

— Peirce-Smith Converter: optimal blow-in timings
— Anode furnaces: final point for reduction
— Eliminating costly, complex, and time-consuming analyses during operation
— Precise off-gas peak prediction, reducing the addition of reactants
— Slag conditioning by calculating the ideal raw material mix

We are happy about our progress in this field so far and are even more excited about further developing the technology to deliver next-generation metallurgical plants that perform more effectively and efficiently, serving our industry at the highest level of deep knowledge of process metallurgy. ●

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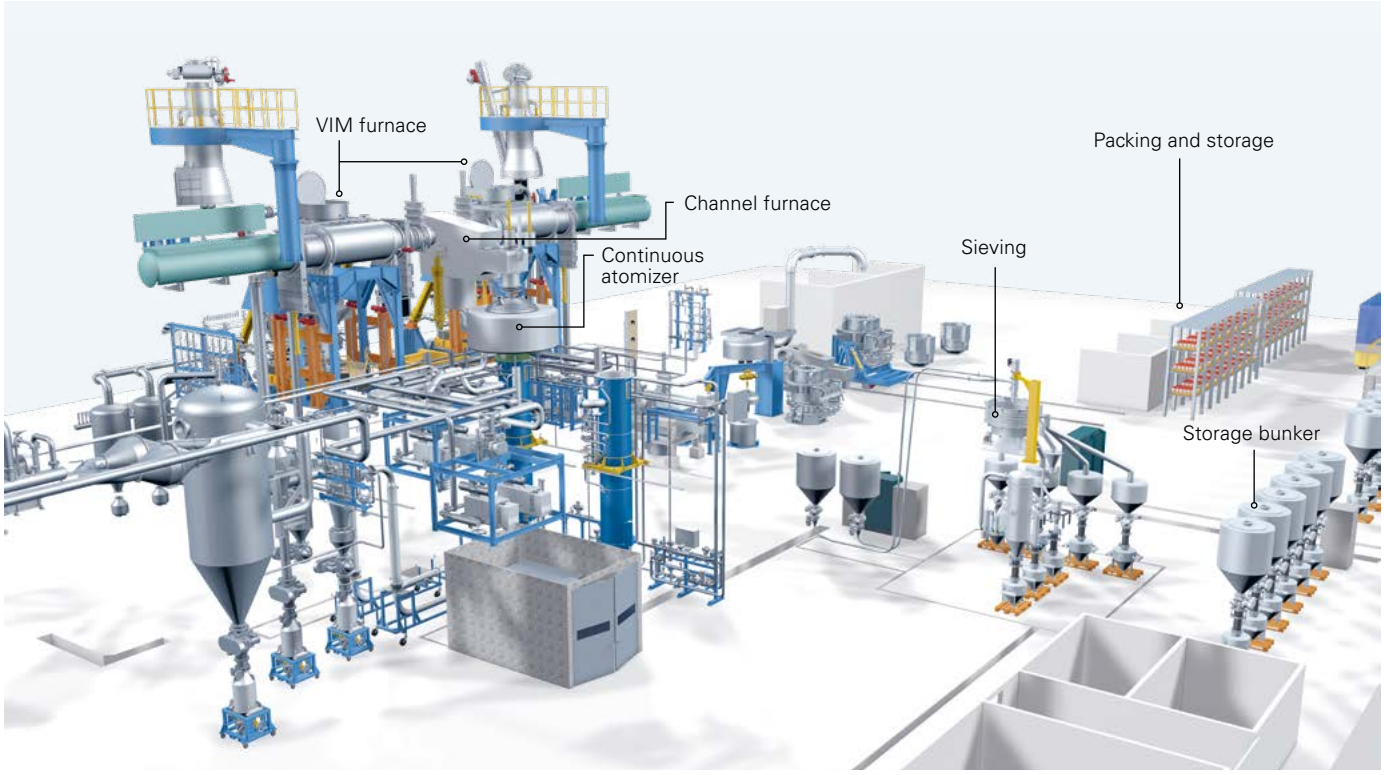
Milestone for industrial breakthrough of additive manufacturing

Our newly developed continuous powder production process enables up to 4,000 tons of high-quality metal powder to be produced every year for additive manufacturing (AM) and other technologies.

Layout of a plant for continuous powder production



COMPARISON OF VIGA WITH NEW CONTINUOUS POWDER PRODUCTION PROCESS

Gas atomization (VIGA)



Batch-wise melting and atomization

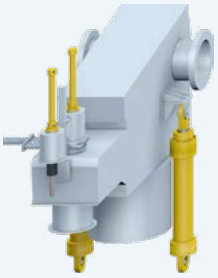
VS.

Continuous powder production process



Two VIM furnaces

→



Holding furnace

→



Continuous atomization

The demand for metal powder has grown significantly in recent years, particularly due to the ongoing industrialization of additive manufacturing. In order to meet the high quality requirements, powders are atomized under inert gas during the gas atomization process. With some alloys, melting is additionally performed under vacuum, in a vacuum induction melting gas atomization (VIGA) process.

Gas-atomized metal powders are produced as standard in a batch process. The typical batch process starts with the melting of the charge material under vacuum gas or inert gas. The entire liquid melt is then atomized through a nozzle under inert gas. However, longer heating and cooling phases between batches make this mode of operation relatively inefficient.

That's why SMS group has developed a highly innovative, continuous powder production process. This development was brought about in close collaboration with a major company based in the U.S.

The continuous powder production plant enables the cost-effective, large-scale production of up to 4,000 tons of powder per year. This system offers capacity levels that are many times higher and production costs for spherical, high-quality metal powders are now significantly lower. The increased capacity creates enormous economies of scale. Set-up times as well as melting and cooling times are reduced. In addition, the continuous process reduces the number of personnel required as well as specific electricity consumption. Overall, this leads to significant reductions in CAPEX and OPEX for every ton of powder produced.

How the continuous plant works

In the new process, melting and atomization are performed separately and independently. Two large Vacuum Induction Melting (VIM) furnaces continuously hold the liquid melt, which is atomized successively through the nozzle using inert gas at high pressures of up to 65 bar. One VIM furnace melts the charge material while the other pours the liquid melt. To achieve the highest level of purity of the powder during production, the melting and refining of metals and alloys takes place in a vacuum or inert gas atmosphere. Generally, the highest degree of quality is attained, as with the VIGA process.

The nozzle is the weak point in the atomization process. To avoid having to interrupt the process following a nozzle unit failure, the new process allows the unit to be changed quickly and easily during operation. The feedstock is melted under vacuum to ensure the highest quality levels, as with the conventional process. In contrast to the VIM route, where pure scrap is used as feedstock, the new process can also work with an existing liquid material supply, like in a meltshop for example. The metallurgical route with basic scrap as feedstock is also possible, resulting in lower input material costs. In this scenario, the material is melted in an electric arc furnace and treated by a vacuum oxygen decarburization unit.

After atomization, the powder-gas mixture passes through pipes to the cyclone, where it is separated using redundant pipe and cyclone units for different materials.

The new process is backed up by an intelligent powder handling and storage system. A new type of screening and classifying unit automatically classifies the powder. Packing takes place in an automatic robot-controlled packing machine, specially designed to handle the large quantities of powder. A scrap warehouse and a packaging area complete the integrated factory solution. ●

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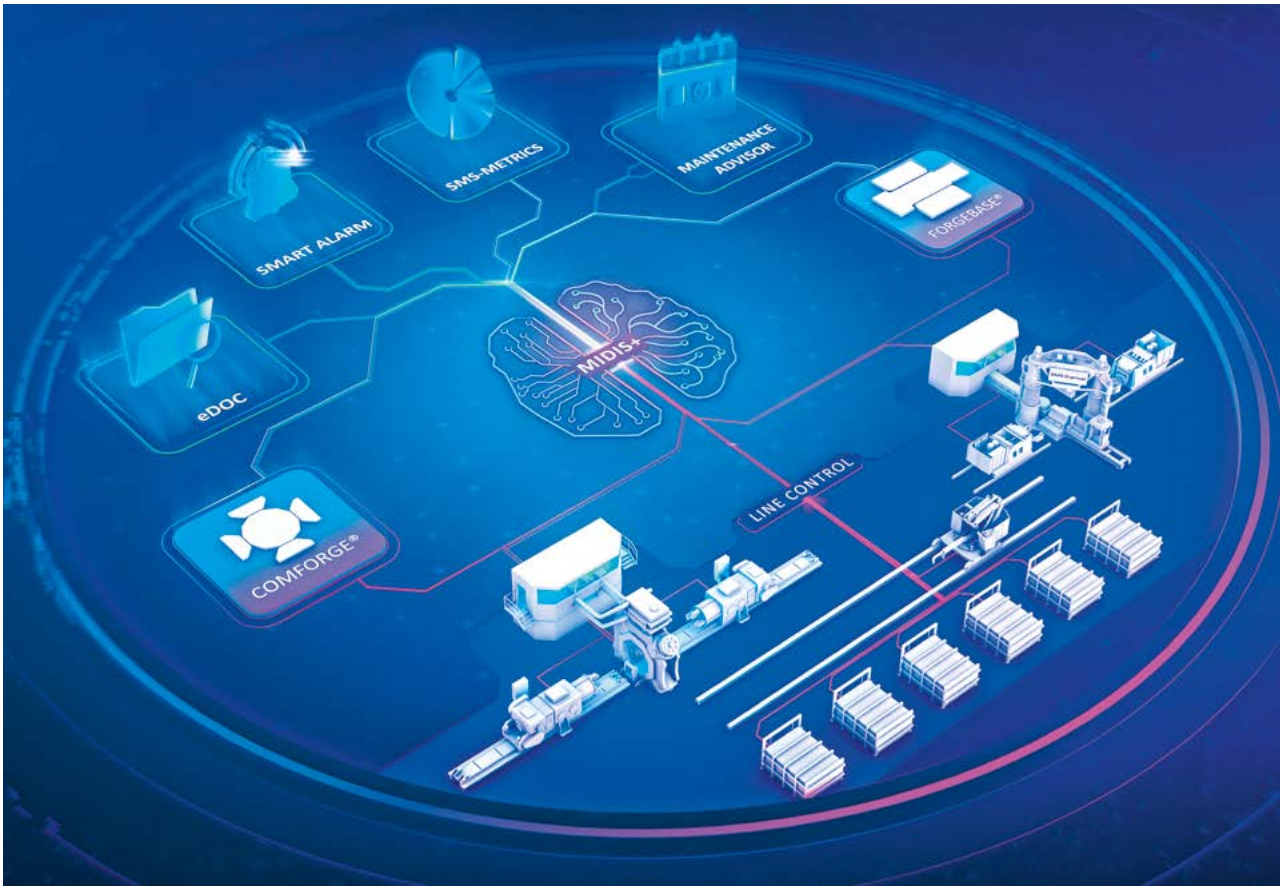
SMS group provides a holistic yet modular approach towards digital transformation in the world of forging.



Modular digital packages for forging plants

With a set of modular packages, forging plants enter the era of digitalization. They help the forging industry generate value from their data and continuously improve their plants' productivity, quality, availability, and energy efficiency. All solutions can be combined and apply to existing plants from any supplier.

In both open-die forging and radial forging, processes and the degree of automation vary widely. While some producers focus on specialized single-item production, others have highly automated production with large lot sizes. Accordingly, the requirements for digitalization vary. For individual production, digitalization and the detection of trends is especially difficult due to low repetition of the same production conditions. There is often a complex combination of different process steps, each of them having an important impact on the quality of the product. Also, different routes might lead to comparable results as compensation in case of deviations are possible. A reliable tracking system that prevents mismatch and a good quality and energy certification system are essential.

When producing the same products more regularly with less manual intervention, machine data collection, automatic process analysis, and a continuous data-driven improvement process add the highest value. SMS group has developed specialized solutions that can be applied stepwise for these different needs, focusing on realizing the most benefits with the lowest investment. Gradually increasing the degree of digitalization by adding more solutions and interlinking them is the path to a fully digitalized plant.

Our Management Information Diagnostic Indication System

On top of the local automation system and the corresponding line control, the Management Information Diagnostic Indication System (MIDIS+) is the brain of the plant.

We developed it to fit the specific needs of the process, handling the production from raw material delivery and storage to packing and shipment of the final product. MIDIS+ takes over the orders from the ERP system and manages the short and medium-term planning. It provides specific recipes so that the set points for all production steps can be passed on to the local automation system automatically, depending on the final product. It also tracks the material through the entire process, and the corresponding measuring data is associated with the product for further evaluation. Specific reports and product passports are provided to ensure full transparency of the quality and energy consumption of the product. While planning and reporting occur in office floor applications, specific dialogues are also integrated into the shop floor local automation. This allows the management and tracking of tools, interruptions, and materials. It builds the basis for the continuous improvement process, which can be started in MIDIS+ and continued in, or combined with, SMS group's other digital solutions.

ComForge® and ForgeBase® Forging Technology Suites

ComForge® and ForgeBase® Forging Technology Suites are technology solutions to optimize production by calculating the optimal process parameters (e.g. pass schedules and furnace temperature set points) depending on the individual process. While the general functionality is similar, ComForge® is dedicated to radial forging, and ForgeBase® specializes in open-die forging. The solutions can be integrated into the automation system and used during live production but also used as office floor applications for planning, optimization, and analysis purposes.

Intelligent data analytics with SMS-Metrics

The overall goal of digitalization is to harvest existing data and generate value from it. This is true for individual process steps but also for the entire line. While MIDIS+ focuses on product-specific analysis and builds the basis for metadata like tool usage, interruption reasons, materials properties, or the final product quality, SMS-Metrics collects detailed time series data from the PLC, combines it (if available) with data from MIDIS+, and supervises the process in real time. The solution is scalable and easy to maintain – and it is preconfigured to the needs of the specific process to provide tangible benefits from day one.

SMS-Metrics provides predefined integrated rules and dashboarding functionalities to monitor parameters and results from process analysis. The →

SMS-METRICS

SMS-Metrics focuses on automatic process analysis, summarized as process stability, and combining various processes that impact quantities.

focus is on automatically supervising the machine data and creating an alert in case of deviations from the normal behavior. This can be achieved by integrating product information into the evaluation.

SMS-Metrics addresses all areas for optimization:

- Production, with a total productivity overview of all forging presses as well as more detailed views for each press for management level
- Condition monitoring, with a focus on the needs of the maintenance team
- Energy management, with a focus on needs of the energy management and process improvement team
- The process, with a focus on the needs of the technology and process improvement team

The different views are based on SMS know-how and are constantly extended as part of the Software as a Service (SaaS) offer – also as a result of user feedback. An additional advantage is the effortless extensibility to using machine learning algorithms, as SMS-Metrics ensures that clean data is stored. Other tools, e.g. the AIXpert from SMS digital, can access the data directly and facilitates straightforward integration of artificial intelligence at a later time.

Intelligent alarm management system

The local automation system evaluates and checks process and machine data against specific limit values. If these are exceeded, corresponding alerts are generated and shown on the local automation HMI.

The intelligent alarm management system Smart Alarm facilitates working with this information regarding the health status of the plant. Here, the alarm messages from all automation systems are collected and permanently stored. Several additional features such as notifications via email or short message, solution management or alarm occurrence analysis are integrated in the system. Smart Alarm is a SaaS solution, which is continuously developed and new features are added. The software offers several benefits, including faster troubleshooting times, better know-how management, and lower maintenance costs due to improved maintenance planning.

Maintenance Advisor

The Maintenance Advisor is an easy and simple system to organize and track maintenance activities electronically. On most plants, maintenance is tracked via hand-written, individual, and often confusing notes and hence it is difficult to track and evaluate what actually happened. With our solution, maintenance activities can be planned manually or by triggers, e.g. based on time, runtime, counters, or load. The scheduled activities are visualized and their execution is tracked digitally for later analysis.

The benefits are longer usage of wear parts due to better and load-orientated planning, more reliable maintenance works due to clear schedules and reminders, as well as more efficient tracking directly at the machine with mobile devices through a web-based system.

Electronic document management

SMS group provides its documentation in an electronic format to make it easily accessible and to increase overall plant transparency from site to individual part. It facilitates smart and fast navigation through all equipment, with convenient part identification via equipment trees, hotspot diagrams, and versatile search functions. Search times are significantly reduced, and part mismatches are avoided. The same-parts search function shows users whether a part is used in different locations, which is helpful for spare part optimization, and in case a missing spare part needs to be replaced in a critical spot.

Your roadmap towards digitalization

The road towards digitalization is as individual as the processes and their producers. In general, there are two reasonable approaches. A general approach starts a continuous improvement based on data. In the so-called digital learning cycle, existing data is collected, possibly supplemented with additional sensors or a MIDIS+ system for tracking and planning the process digitally. The focus is on visualizing and analyzing the data with SMS-Metrics. Together with SMS group experts, KPIs are created and deviations from normal behavior are detected. These can be analyzed to learn where a process can be improved. Any potential found is exploited and baked in by creating new rules and alerts. Additional dashboards can be created to access more detail, and new sensors can be added, depending on the actual needs.

A more specific approach can be applied if an already known, specific optimization potential is to be exploited. That could range from increasing a machine's uptime, energy efficiency, quality, or process efficiency. In a first step, SMS-Metrics is installed to collect and store the current process data – again, depending on the existing infrastructure, supplemented by other sensors or systems. At this point, it is possible to establish a baseline of the current performance to measure the success of the optimization. Based on the data collected, SMS experts combine their machine know-how with the producer's expertise to analyze the process and uncover improvement potential. As an option, machine learning methods can be employed to locate impact factors. In the final phase, the continuous improvement process is started, ensuring that any found potentials are continuously exploited and extended. ●

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Customer example of SMS-Metrics energy dashboard



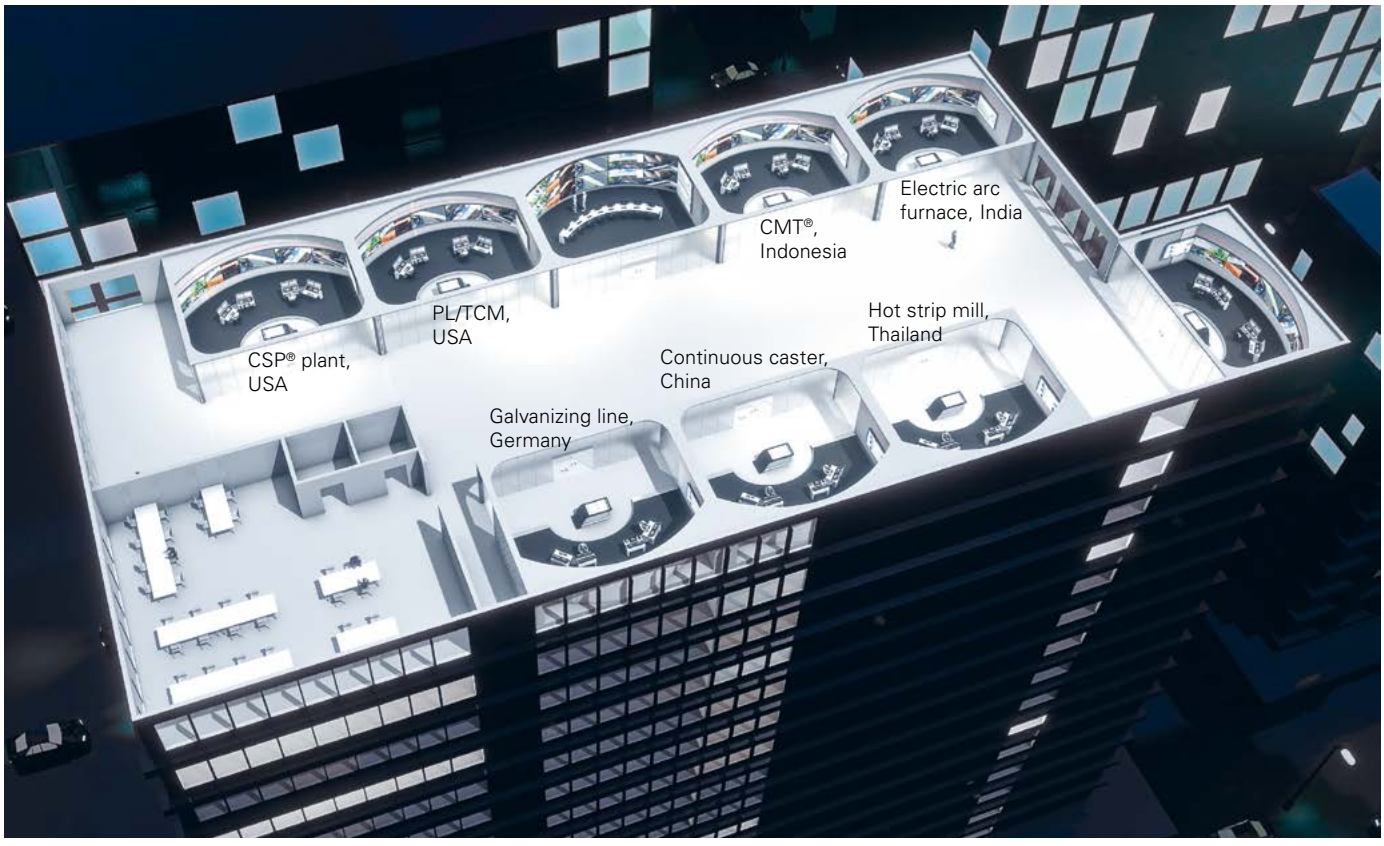
Open-die forging press with ForgeBase®

Autonomous operation

The fully autonomous operation of a plant complex is no longer a mere vision. It provides extraordinary potential in sustainability, productivity, and plant availability. We will be presenting our X-Pact® Lights-Out operating concept at the METEC 2023 trade fair.

How do you eliminate the need for operators to always be present in a production plant? Are they really required on-site to prevent unplanned line stoppages? Or is it possible to operate a single plant, or even an entire plant complex, fully remotely? What about a scenario in which a plant was to be staffed by a minimal on-site crew in collaboration with an expert team located, let's say, on the other side of the world? What would it take to implement a genuinely holistic approach comprising everything from the sensor level to the latest developments in digitalization? To which degree should a plant be automated? What kind of AI-based assistance functionalities will shape the path to

ONE team of experts
for all sites worldwide



autonomous operation? That is what X-Pact® Lights-Out is all about: It is our concept for highly dynamic, resource-saving, autonomous plant operation.

X-Pact® Lights-Out concept

With X-Pact® Lights-Out, our vision of autonomous plant operation has become a reality. To improve the efficiency of everyday production, the main objective is to achieve the highest level of process stability possible by reducing the necessary staff to a minimum. The X-Pact® Lights-Out concept represents a paradigm shift in production plant operation. Currently, the need for operators to be physically present on-site to monitor the performance of their equipment is mostly considered essential. In the future, however, the X-Pact® Lights-Out concept could make it possible to operate individual machines or all units of a plant complex from centralized on-site or even off-site operator stations.

For large companies with various locations in different parts of the world, this could provide several benefits. Their operational expertise could be concentrated, operator training could be centralized, and the exchange of information among members of the core operations team could be intensified. It would also be possible to establish centralized training centers using digital twins and global operating centers that are always available regardless of the time zone.

We help our customers realize their vision of a Lights-Out factory, allowing them to focus even more on their core business and strategic tasks. They will benefit in multiple ways, for example, from:

— High-performance autonomous production
— Remote operation of entire production complexes
— A highly qualified team of experts
— Maximum transparency of plant operations

The Lights-Out factory is also the future of industrial production regarding sustainability. Using the latest predictive analytics not only increases plant performance and efficiency but also helps to further reduce CO_2 emissions by avoiding waste, improving the plant's availability, and lowering overall energy consumption.

The ubiquitous shortage of skilled workers has the potential to even further accelerate the Lights-Out approach.

ONE pulpit: Fully networked plant with remote pulpits

A single control pulpit per line and a single, integrated, and centralized operator station for the entire plant complex. For CSP® plants, for example, several control desks could be combined to form a single operator station, enabling a single person to monitor and control several different subprocesses simultaneously.

Deep automation and maximum use of predictive maintenance make it possible to reduce the number of staff required on site. To this end, the various units of a plant complex are completely networked and connected to remote control pulpits. Real-time views of the plant, along with augmented reality (AR) and 3D visualizations, are displayed on large screens, along with key performance indicators (KPIs) related to plant status, product quality, energy management, and production planning. This enables centralized data management for all stages of production.

ONE team: Specialized remote control crew

In a Lights-Out factory, all automation systems remain physically installed at the production facilities but are controlled centrally by a remote, highly specialized team of experts. This physical distance requires highly dynamic plant automation systems with the highest demands in IT communication capabilities for plant visualization (HMI) and also live camera views from and to the site. The remote teams and their local counterparts cooperate through the control pulpits and smart communication methods to achieve efficient operation and effective plant maintenance.

ONE view: Maximum transparency and supervision

An entire steelmaking complex, from the melt shop to the finishing lines, can be integrated into one centralized operator station – not only when building a new plant complex but also as a retrofit to existing facilities.

The X-Pact® Vision Integrated Operating Center (IOC) plays a pivotal role in this process. It consolidates all the operational expertise related to production processes in a single location, enabling a concentrated flow of information that facilitates plant and logistics management. This significantly reduces the need for human resources. All the data needed for production analysis, performance evaluation, and shift meetings is readily available at any time.

Several of our customers are currently running tests for the remote operation of their production facilities. After improving the process monitoring and supervision efficiency at their plants, some of them are already testing true remote operation. Increased process stability through AI and machine learning is crucial to successfully navigating the path to a Lights-Out factory.

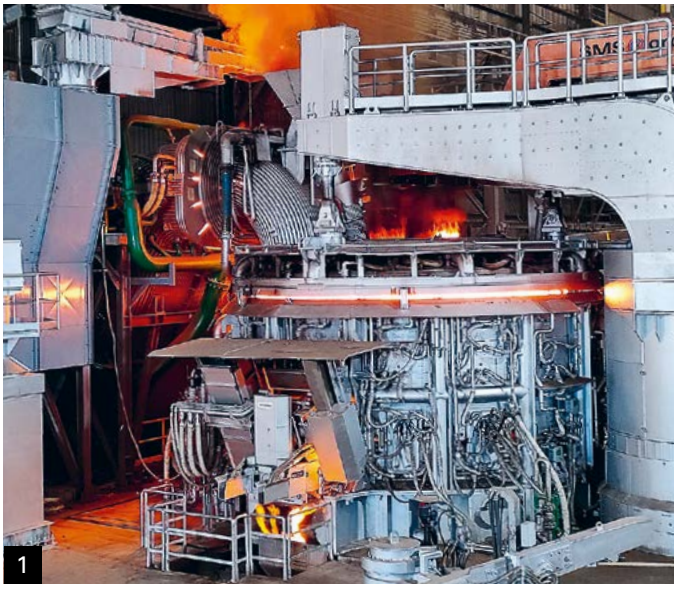
ONE partner: Integrated, single-source approach

SMS group is ideally positioned to support our customers on their way toward more sustainable and profitable operations. Our integrated solutions combine 150 years of experience in metallurgy and plant engineering with a deep understanding of digitalization. Our motto for this integrated approach: Our Drive – Your Performance. ●

METEC 2023

SMS group will be presenting the Lights-Out operating concept at METEC 2023 in Düsseldorf, Germany, 12–16 June.

See our video on X-Pact® Lights-Out



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Success stories

Your projects are the heart of what we do. Each project is unique and gets our full attention. Here we showcase a selection of latest orders and start-ups. For a complete list, please visit **www.sms-group.com/success-stories**



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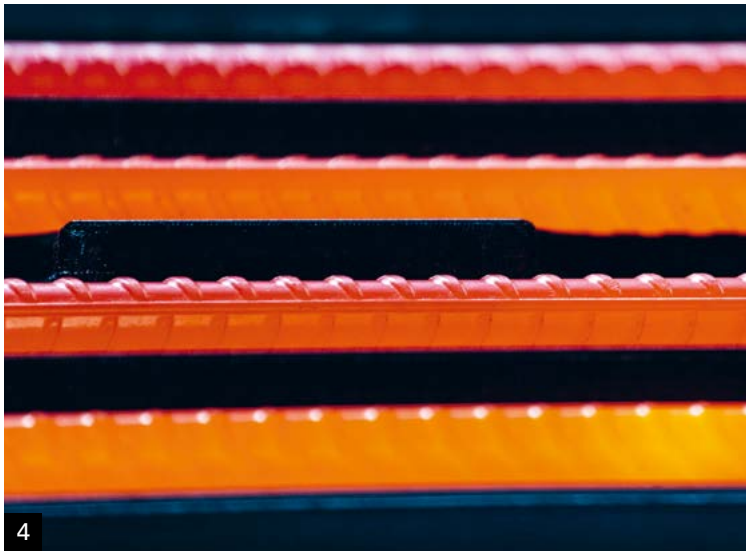

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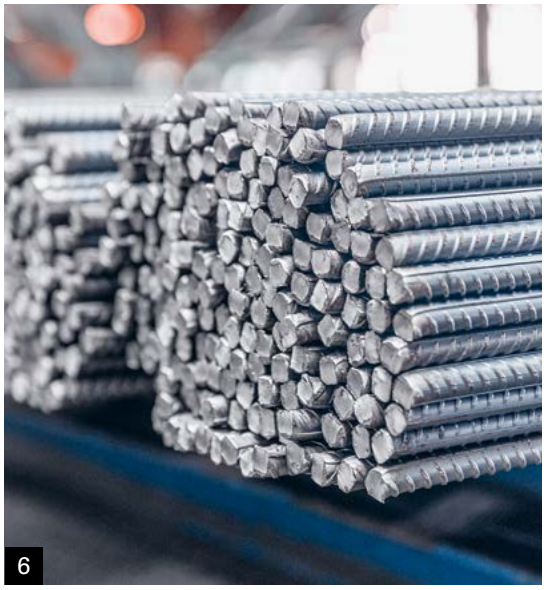
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8 BIG RIVER STEEL, 9 NUCOR STEEL GALLATIN, 10 OHMI PRESS WORKS AND FORGING

Orders and start-ups

New rebar minimill in the USA



Highbar LLC orders an environmentally sustainable rebar minimill and places options on two additional minimills.

Highbar LLC, a new scrap metal recycling and steel production company focused on environmental steel production, has placed an order to build new rebar minimills in the United States. The first rebar mill will be built on a site just outside of Osceola, Arkansas, USA, and site selection activities are underway for the other two locations.

Dave Stickler, Highbar's Chief Executive Officer, stated: "SMS has been and continues to be at the forefront of advancing the world's steel industry in terms of operating efficiency, ever increasing quality capabilities and environmental sustainability. I fully expect the SMS-supplied rebar minimill to build on the tremendous success my partners and I have had developing many of the finest scrap metal recycling and steel production facilities in the world while using SMS technology."

The minimill will feature SMS group's CMT® (Continuous Minimill Technology) a low-emission and energy-efficient steelmaking system that supplies liquid steel to a high-speed caster that directly feeds the rolling mill in a single, highly reliable process. Efficiency is increased by the SMS group's AURA DC (Advanced Unit Rectifier Assembly) powered electric arc furnace with All-charge continuous feeding system and robotic solutions that improve labor efficiency.

SMS Concast will be supplying a high-speed single strand caster and the link to the rolling mill will be through an induction equalization furnace provided by SMS Elotherm. The rebar mill is equipped with fourteen housing-less stands and an eight-pass MEERdrive® high-speed finishing block. SMS group's quenching and soft cooling TMbaR thermo-processing systems will be incorporated into the rebar mill. The minimill will have Industry 4.0 digital solutions and AI-controlled processes to be future-ready to take advantage of digitalization from start-up. The design is such that natural gas is not required during the production process, a first of its kind, achieving an extremely low carbon footprint and up to a 50 % reduction in emissions compared to other leading rebar mills.

CUSTOMER
Highbar LLC, USA

SUPPLY
Steelmaking plant and CMT® for rebar production

STATUS
New order, start-up in 2025

HIGHLIGHT
50 % reduction of emissions compared to other leading rebar mills

Forging plant with integrated process and production control system



Perryman orders two new forging machines.

American titanium producer Perryman Company has ordered two new forging machines. The order comprises a 40/45 MN high-speed open-die forging press in the pull-down design and an SMX 500/15 MN hydraulic radial forging machine with two forging manipulators, as well as the order and production control system for the entire line. SMS will supply specifically tailored digitalization tools and technology packages such as MIDIS+, technology packages ForgeBase® and ComForge®, SMS-Metrics, Smart Alarm and Maintenance Advisor.

CUSTOMER
Perryman Company, USA

SUPPLY
Forging line for titanium with fully integrated process and production control system

STATUS
New order, start-up in 2024

HIGHLIGHT
Digital solutions and technology packages enhance productivity and efficiency levels

First integrated operating center



Daye Special Steel receives Integrated Operating Center.

SMS group has completed its first X-Pact® IOC (Integrated Operating Center), a central monitoring room for the entire 460 mm tube plant, at Daye Special Steel. Cameras installed along the production line provide the basis for centralized operator monitoring, thus eliminating the need for operating activities in the harsh environmental conditions found in the metallurgical industry. The automation system utilizes AI video analytics to respond to abnormal situations during production.

CUSTOMER
Daye Special Steel Co. Ltd., China

SUPPLY
First X-Pact® IOC for centralized operator monitoring using AI video analytics

STATUS
In operation, start-up in 2022

HIGHLIGHT
Only six insted of fifteen operators are required to supervise the entire rolling line

One of the most powerful mill stands in the world



Tisco starts production with new 4.3 m heavy plate mill.

Shanxi Taigang Stainless Steel Co. Ltd. has successfully put its new 4.3 m heavy plate mill in operation. The new mill is designed for an annual capacity of 700,000 tons of stainless steel products. Thanks to the new mill, Tisco can provide the market with an extended portfolio of advanced grades, such as stainless and duplex steels, nickel-based alloys, and super austenitic grades.

CUSTOMER
Shanxi Taigang Stainless Steel Co. Ltd. (Tisco), China

SUPPLY
4.3 m heavy plate mill with attached edger including CVC®plus technology

STATUS
In operation, start-up in 2022

HIGHLIGHT
With a rolling force of 109 MN, the new heavy plate mill is one of the most powerful mills of its kind in the world

Hydrogen-ready merchant bar mill



Megasider Zaragoza orders merchant bar mill.

Megasider Zaragoza S.A.U. has placed an order for a merchant bar mill equipped with environmentally-friendly heating technology. The facility will be designed to produce a wide range of merchant bar products to complement and expand the existing product portfolio. SMS supports Megasider in its goal of achieving natural gas-free production and digitalizing the plant for a particularly environmentally-friendly processes.

CUSTOMER
Megasider Zaragoza, Spain

SUPPLY
Merchant bar mill

STATUS
New order

HIGHLIGHT
Hydrogen-ready merchant bar mill

One of the world's largest slab casters in operation



Nucor Steel Brandenburg to supply steel needed for offshore installations.

The single-strand slab caster at Nucor Steel Brandenburg for ultra-wide and thick slabs continues its successful ramp-up of production. Designed for an annual capacity of 1.45 million tons, the slab caster is a core element of the production chain for the new plate mill. The caster is used to cast slabs ranging from 8 to 12 inches (203 to 305 mm) thick and 60 to 124 inches (1,524 mm to 3,150 mm) wide. Various special technological features are integrated into the new vertical-bending caster, such as robot applications on the casting platform, Liquid Core Reduction and quench cooling in segment 0, tiltable foot rollers and HD mold^{FO} with optical fibers and electromagnetic stirring.

CUSTOMER
Nucor Steel Brandenburg, USA

SUPPLY
Single-strand slab caster

STATUS
In operation

HIGHLIGHT
Slabs range from 8 to 12 inches (203 to 305 mm) thick and 60 to 124 inches (1,524 mm to 3,150 mm) wide

Performance partnership within a subscription model



Siderúrgica Huachipato is on the way to energy efficiency.

SMS group has signed an agreement to implement a package of advanced digital services for the Siderúrgica Huachipato steel mill at the Talcahuano site. SMS will implement the applications BFXpert®, Viridis Dispatch, Viridis Carbon, and Viridis Performance, leading to more efficient production processes and a reduced carbon footprint. The applications enable Huachipato to optimize the gas flows throughout the plant and reducing natural gas consumption. In addition, carbon and other emissions can be tracked and certificates for each product unit can be issued.

CUSTOMER
Siderúrgica Huachipato, Chile

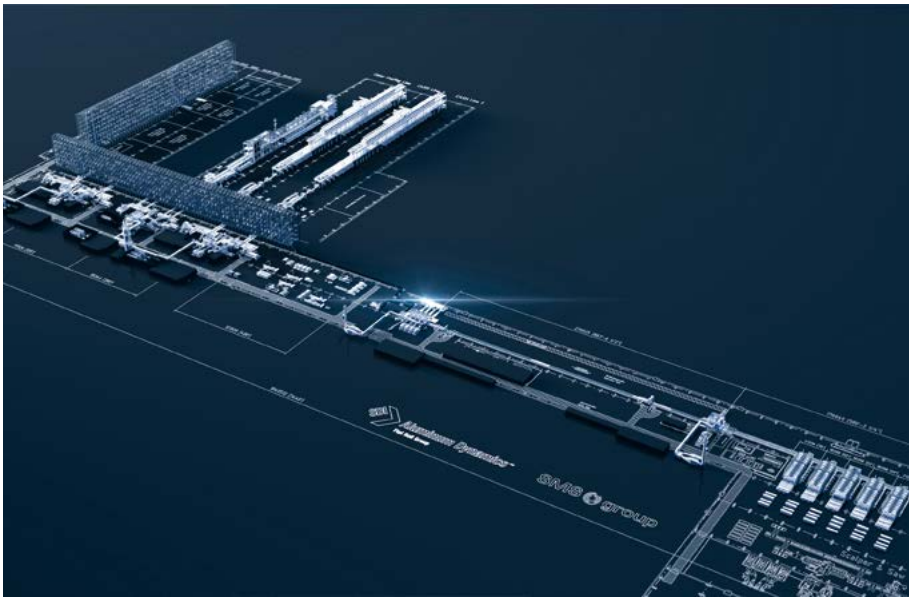
SUPPLY
Implementation of digital applications for more efficient production processes and a reduced carbon footprint

STATUS
Performance partnership within a 36-month subscription model

HIGHLIGHT
Reducing CO_2 emissions by up to 14,000 t/year

Looking for more news? You find all new orders and start-ups on our website: **www.sms-group.com/success-stories**

Steel producer expands to aluminum



CUSTOMER
Aluminum Dynamics LLC, USA

SUPPLY
Hot and cold mill aluminum complex

STATUS
New order, start-up in 2025

HIGHLIGHT
A new player in the aluminum market

Steel Dynamics Inc. orders hot and cold rolling complex for aluminum.

Steel Dynamics Inc., a North American steel producer and metals recycler, placed an order for the supply of a new state-of-the-art aluminum flat rolling mill for Aluminum Dynamics, LLC, to be built in Columbus, Mississippi. We will supply the integrated hot and cold rolling complex for a production capacity of 650,000 tons of aluminum strip per year, mainly for applications in the sustainable beverage packaging, automotive, and common alloy markets.

We were selected for this project based on our technological expertise and the long-standing history shared by SMS and SDI. The relationship with SDI stretches back to the mid-1990s when the two partners completed a large number of successful projects, the most recent being their newest steelmaking facility in Sinton, Texas.

The main order scope includes the hot strip mill, two tandem cold mills, a single-stand cold rolling mill, two highbay storage systems, and a can coating line. All plants include our integrated solutions for the electrical and automation equipment. Thanks to this integrated approach, SMS is ensuring that the electrical and automation systems work in perfect harmony, helping to shorten the plant ramp-up time and increase the overall performance of the entire aluminum flat rolling mill.

The new facility will utilize a significant amount of aluminum scrap, provided by SDI's metals recycling platform OmniSource. SDI intends to apply its experience and knowledge in the field of metals recycling in the production of flat rolled aluminum products. There is even the option of upgrading secondary aluminum scrap, as new sorting technologies are now available. This will help to raise production to a new level of efficiency and quality. Alongside the technological expertise, customers are set to benefit from SDI's sustainable and customer-centric approach in the market for aluminum flat rolled products. With its new production complex, SDI plans to satisfy growing demand in the sustainable beverage can industry.

Aluminum meets innovation

The demand for aluminum is growing all over the world, not least because of the material's excellent recyclability, versatility, and lightweight design potential. At the same time, the spotlight is steadily shifting onto the ecological footprint of aluminum production and processing. That is why all new plants for aluminum flat products now focus on resource and energy-saving technologies, as underlined by three current orders for aluminum cold rolling mills.

LATEMALUMINIUM Newcomers count on the circular economy



LatemAluminium will be able to produce cold strip in widths up to 2,200 millimeters.

A new entrant to the aluminum market is LatemAluminium from Spain. For its ambitious investments in plants for recycling aluminum and producing high-end flat products in the province of Castilla y León in the north of Spain, SMS is supplying a state-of-the-art aluminum cold rolling mill including ancillary facilities for environmentally friendly and sustainable plant operation. The new cold rolling mill, coupled with SMS group's expertise, will support LatemAluminium in bringing tailor-made aluminum products to market. Macario Fernández, CEO of LatemAluminium, explains: "We can always count on SMS technology and are looking forward to the production process." The six-high stand is equipped with the CVC®plus (continuous variable crown) technology developed by SMS for work roll and intermediate roll shifting. Combined with other actuators for flexible and precise roll gap adjustment, this technology is capable of producing cold strip in widths of up to 2,200 mm. The mill comes with fully automatic coil and spool handling for efficient operation. SMS group is supplying a fully harmonized mechatronic plant solution. This includes not only the mechanical equipment but also the proven X-Pact® electrical and automation modules specially designed for the aluminum rolling process. The scope of supply also includes auxiliaries such as the rolling oil recovery system and a CO_2 fire extinguishing system. The advanced rolling technology is in line with LatemAluminium's commitment to the environment. For example, SMS is supplying a Multiplate® filter to clean the used rolling oil. The AIRWASH™ system recovers and prepares the rolling oil for reuse and also cleans the exhaust air. This means it is not only better for the environment, it also helps to cut costs.

CUSTOMER
LatemAluminium, Spain

SUPPLY
Six-high single-stand cold rolling mill for aluminum, including auxiliary plants and X-Pact® electrical and automation systems

STATUS
Start-up in first half of 2024

HIGHLIGHT
Up to now, Latem has been active in the zinc industry and now plans to expand its business to include high-end flat aluminum products based on recycled aluminum.

ELVALHALCOR World's largest AIRWASH™ system in operation

Greek aluminum manufacturer ElvalHalcor S.A. has equipped its cold rolling production plant in Oinofyta, close to the Greek capital of Athens, with an AIRWASH™ system for exhaust air cleaning, designed and supplied by SMS group. A special feature and also a certain challenge for the actual delivery of the AIRWASH™ system to ElvalHalcor was its size, since the system is not only designed for a single cold rolling mill, but is also able to cover the exhaust air volume of the two existing rolling mills as well as any potential future cold rolling capacities. Furthermore, it is the first AIRWASH™ system of its kind to be located on the ceiling of the roll shop below. For SMS, it is the largest AIRWASH™ system to date and boasts an exhaust air capacity of up to 450,000 cubic meters per hour. In theory, a maximum rolling oil quantity of 425 kg/h can be recovered and conveyed back into the rolling process. In October 2022, ElvalHalcor awarded SMS group the final acceptance certificate for the successful completion of the project.

CUSTOMER
ElvalHalcor S.A., Greece

SUPPLY
AIRWASH™ system for aluminum cold rolling mill

HIGHLIGHT
Largest AIRWASH™ system to date that can recover up to 425 kg rolling oil per hour from exhaust air

AIRWASH™ systems have two major advantages: They clean the exhaust air and recover rolling oil from it at the same time. Unlike mechanical separators, which only separate droplets, the AIRWASH™ system is able to separate and recover droplets and gaseous components. AIRWASH™ systems are considered particularly efficient, because a maximum amount of rolling oil can be recovered by means of absorption and distillation.

AIRWASH™ system for exhaust air cleaning



HINDALCO On course for growth



Hindalco will produce high-quality cold strip down to 0.1 mm thickness.

SMS group is supplying a high-performance cold rolling mill for wide aluminum strip to Hindalco Industries Limited, one of the world's largest aluminum producers. Hindalco serves the local and international markets with its aluminum products and covers the whole alloy spectrum from soft to very hard aluminum grades. The new cold rolling mill is part of Hindalco's strategy to expand its portfolio to include products with high added value and to meet the growing demand for sustainable aluminum solutions, for example for packaging, beverage cans, or in the design and construction sector. The new cold rolling mill features the proven combination of CVC®plus technology and other comprehensive actuators, which guarantee the highest product quality for strips with a width of up to 2.2 m and a thickness of up to 0.1 mm. Furthermore, the advanced rolling technology reflects Hindalco's focus on eco-friendly technologies. SMS will supply two Multiplate® filters designed to clean the rolling oil. The exhaust air is cleaned by an AIRWASH™ system.

CUSTOMER
Hindalco Industries Limited, India

SUPPLY
Aluminum cold rolling mill including auxiliary plants

STATUS
Start-up end of 2024

HIGHLIGHT
Highest product quality for aluminum strip up to 2,200 mm wide and 0.1 mm thick

ASAŞ and SMS group: New dimensions

The latest order that ASAŞ Alüminyum, one of Turkey's largest aluminum manufacturers, placed with SMS group tells a great story about the two companies. It features many of the success factors that contribute to SMS group's continued rise in the industry – brought about by a unique combination of vision, strategy, technology, innovation, and partnership.



From left to right: Massimo Marinelli Managing Director, OMAV; Tobias Brune, Vice President Non-Ferrous and Additive Manufacturing, SMS group; Olaf Stalfort, Chief Sales Officer Region Europe, SMS group; Safa Bayar Yavuz, Board Member, ASAŞ and Derya Hatiboğlu, General Manager, ASAŞ

See the Leading Partner Talk with ASAŞ at Aluminum trade fair:

"By integration of the different process steps into one line, we make sure that ASAŞ gets one integrated solution from one company."

—Tobias Brune,
Vice President Non-Ferrous and Additive Manufacturing, SMS group

ASAŞ thinks big, and they are not shy about it. After signing the contract for the order, General Manager Derya Hatiboğlu put it this way: "At ASAŞ, we're all about "most" and "first" in everything." That aptly describes the recent order the company placed with SMS group for supplying one of the world's largest extrusion lines with 150 MN extrusion force and an energy-efficient 45 MN HybrEx® line. The 150 MN extrusion press will be Europe's largest and most powerful. It allows ASAŞ to continue its substantial growth, with new opportunities on the international market to supply extra-large extrusion profiles not currently produced by anyone else in Europe.

Europe's most powerful extrusion press line

The two companies have been working together since 1997, forging a continually growing partnership that is now a progress driver in European aluminum industry and brings unprecedented manufacturing capabilities to the continent. That's why ASAŞ knew precisely what they would get when they awarded the contract for this forward-thinking investment to SMS group. For ASAŞ, working with SMS group represents the peace of mind they can only get from an integrated single-source supplier for all components that make up the lines. The package we're supplying includes induction furnaces from SMS group subsidiary IAS, a 150 MN tube and extrusion press built according to the latest SMS design, and a quench and handling equipment by OMAV, also an SMS group subsidiary. From 18-inch or 24-inch aluminum billets, ASAŞ will be able to produce oversized profiles with a maximum width of 900 mm and a maximum height of 450 mm, e.g., for customers in the railway and marine industries who require profiles in these outsized dimensions.

Energy-efficient press

Size and force are not the only parameters ASAŞ is looking for. Tobias Brune, Vice President at SMS group, is also excited about the other part of the sale. For the second year in a row, ASAŞ ordered a 45 MN HybrEx® extrusion line to expand their capacity geared towards their rapidly growing automotive business. The new line will be equipped with a gas-fired billet furnace and an induction furnace, a 45 MN HybrEx® extrusion press with an energy-efficient hybrid drive system, and the latest quench and runout system with profile stretcher and precise in-line profile cutting. Compared to conventional extrusion presses, the hybrid drive technology will bring impressive energy savings of 30 % to 50 % to ASAŞ' production of the very lightweight yet extremely sturdy profiles used in automotive components such as battery housings or bumpers. ●

Contact
extrusionpresses@sms-group.com

MISSION STATEMENT

SMS group is renowned worldwide for its forward-thinking technologies and outstanding services in the metals industry. We apply our 150 years of experience and digital know-how to continuously innovate products and processes inside and outside our industry. As a partner for the most demanding projects, SMS accompanies its customers throughout the entire life cycle of their plants, thus enabling profitable and resource-saving value chains. Our mission is to turn metals green and to advance climate-neutral and sustainable metals production.

At a glan

MILESTONES: SIX DATES THAT MADE SMS GROUP



1871

Many roots – one company
Carl Eberhard Weiss starts a forging business



1904

Global reach and local expertise
We supply our first rolling mill to China



1952

A partner for megaprojects
Building the first integrated steel plant in India

KEY FIGURES (2022)

Order intake	€ 4,612 million
Sales	€ 3,139 million
Order backlog	€ 5,517 million
Employees	> 14,400

ce

MANAGING BOARD

Burkhard Dahmen Chairman & CEO
Torsten Heising CFO
Dr.-Ing. Thomas Hansmann CTO
Michael Rzepczyk COO
Prof. Dr.-Ing. Katja Windt CDO



1989

Pioneering solutions
We invent CSP® technology – a revolution in sustainability



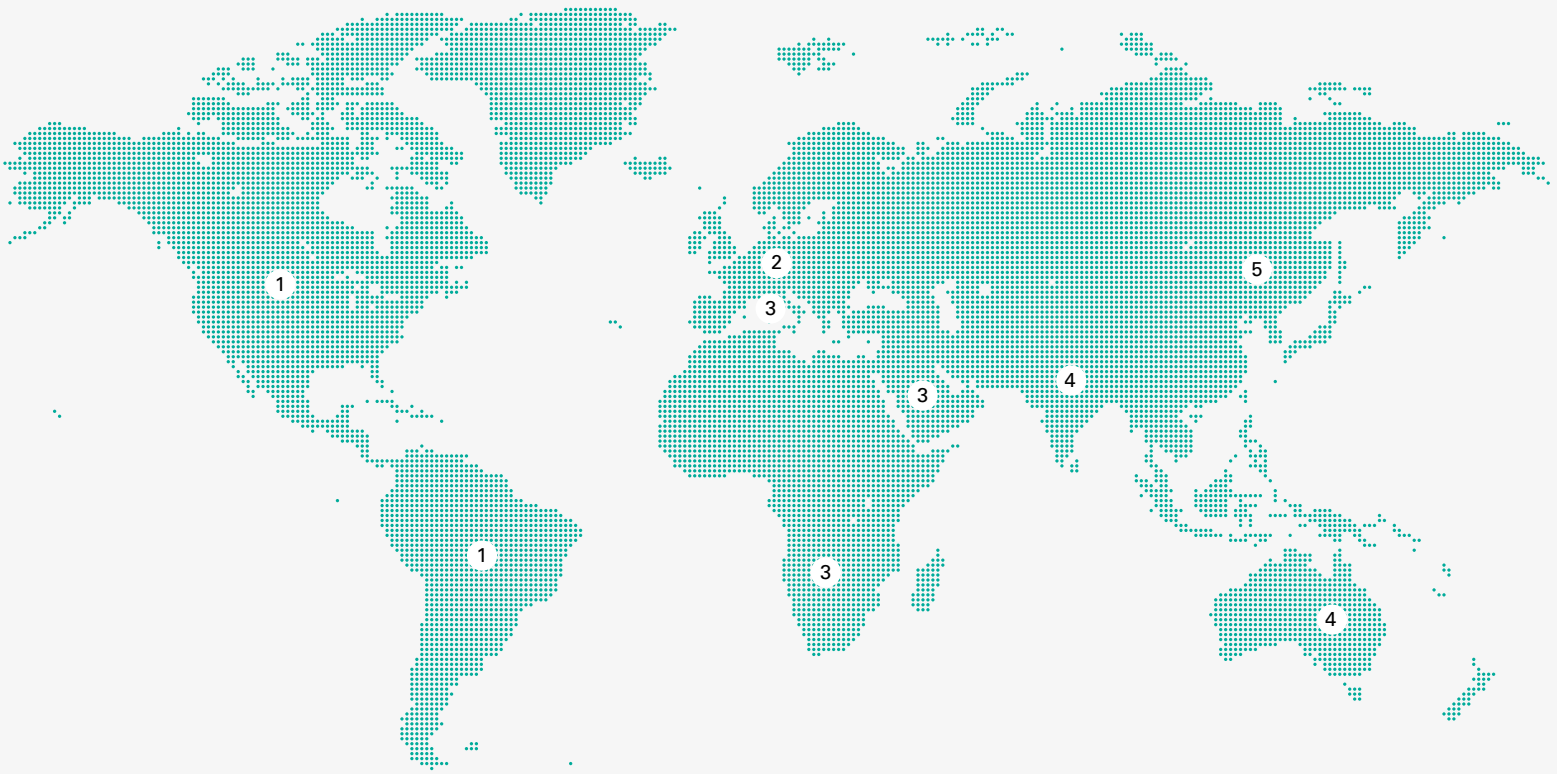
2016

Life cycle partner
The Learning Steel Plant – our first fully digital steel production facility



2023

#turningmetalsgreen
Shaping the future of metals and driving the green revolution



OUR REGIONS

SMS group has always been a truly international company. Today, we have around 100 offices and workshops in 30 countries representing more than 80 % of global steel production.

With our regional setup, we are close to our customers to create added value and develop opportunities and growth. Our regions team up with our worldwide CoEs (Centers of Excellence) for Products and for Services as well as with the CoEs for Implementation and Supply Chain to make your project a succes.

KEY FACTS (2022)

1. AMERICAS

Team members: 2,500
Order intake: € 1,725 million
Headquarters: Pittsburgh, USA
Coverage: North, Middle and South America

2. EUROPE

Team members: 6,800 (incl. SMS group headquarters)
Order intake: € 640 million
Headquarters: Luxembourg, Luxembourg
Coverage: Europe, Turkey, Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan

3. ITALY, MIDDLE EAST AND AFRICA

Team members: 1,000
Order intake: € 173 million
Headquarters: Tarcento, Italy
Coverage: Italy, Balkans, Africa, Arabian Peninsula, Middle East

4. INDIA AND ASIA PACIFIC

Team members: 1,600
Order intake: € 1,431 million
Headquarters: New Delhi, India
Coverage: India, Australia, Japan

5. CHINA

Team members: 1,000
Order intake: € 212 million
Headquarters: Beijing, China
Coverage: China

Foto: Getty Images/Ani_Ka

OUR PORTFOLIO

Plants

Anyone who produces steel, aluminum, or copper knows SMS group. We supply the technology to produce and recycle all major metals and cover the entire process chain from the liquid phase to the final high-quality product.

METALLURGY
Portfolio: Plants for iron making and steelmaking, secondary metallurgy, furnaces for non-ferrous metals and alloys, melting furnaces for aluminum, environmental technology

CASTING
Portfolio: Continuous casting technology for flat and long products, casting plants for aluminum and copper

FLAT PRODUCTS
Portfolio: Hot rolling mills, cold rolling mills, strip processing lines

LONG PRODUCTS
Portfolio: Hot rolling mills, tube and pipe plants, cold finishing mills, copper rod and tube lines

FORGING
Portfolio: Closed-die forging presses, open-die forging presses, radial forging machines, ring and wheel rolling machines, powder presses

EXTRUSION
Portfolio: Extrusion presses for light metal, extrusion presses for heavy metal, tube extrusion presses

Services

We support our customers with integrated services throughout the life cycle of their plants, enabling profitable and resource-efficient value creation.

ELECTRICS AND AUTOMATION
Portfolio: Sensors and devices, power supply, drive systems, process automation, operation, and visualization

DIGITALIZATION
Portfolio: Data infrastructure solutions, asset optimization, product quality, production planning, energy and sustainability management

TECHNICAL SERVICE
Portfolio: Spare parts and logistics, maintenance and repairs, upgrades and modernization

CONSULTING AND TRAINING
Portfolio: Consulting services, TECademy

Expertises

PROJECT EXECUTION
We are a project company. The full weight of our experience, global team network, and the comprehensive expertise of every one of our specialists go into achieving the project execution excellence our customers count on for their success.

MANUFACTURING
The in-house production of core components and preassembly in our own workshops in Germany and abroad is central to our approach.

Beyond

As a technology company, we keep pushing ourselves toward new challenges. We apply our expertise to new fields and venture into new business opportunities.

PORT LOGISTICS
Our joint venture BOXBAY revolutionizes port logistics by bringing automated high-bay storage technology from metals production to overseas harbors.

BATTERY RECYCLING
Closing the loop and decarbonizing battery supply chains with our metallurgical know-how is the mission of our joint venture Primobius.

ADDITIVE MANUFACTURING
We are experts in the entire value chain of additive manufacturing of metals – from producing high-quality metal powder to design and applications.

COATING
Innovative coatings are true multi-talents with enormous potential. Our Coating Competence Center develops and tests new coatings until they are ready for effective industrial use.

ENERGY FROM WASTE GASES
Producing valuable energy from climate-polluting lean gases: This is the innovative approach taken by our joint venture CATALYTIC Power Solutions.



Read more online at:
www.sms-group.com

Company



André Schneider



Jan Heimann



Bernhard Steenken



Thiago Turchetti Maia

Changes in the management team

André Schneider has been appointed as the new CEO of SMS group Region Europe. Mr Schneider also took over the position of CEO of Paul Wurth S.A. in Luxembourg from Georges Rassel. André Schneider has been with SMS group for many years and in various roles, such as Executive Vice President of Forging plants business and CEO of the SMS group Region CIS. His focus will be on fully exploiting the market potential for green steel projects in the Region Europe, and together with the Paul Wurth management team, he will continue to drive decarbonization R&D activities from Luxembourg.

Georges Rassel joins Paul Wurth's Board of Directors. Mr Rassel will focus on further developing subsidiaries, such as Paul Wurth Geprolux and CTI Systems. He will drive Paul Wurth's e-fuel initiatives and projects, including cooperation with the Paul Wurth chair at the University of Luxembourg.

Jan Heimann took over from Alexander Heck and now leads the Technical Service team as Executive Vice President together with Jochen Burg. Mr Heimann looks back on a 15-year career with SMS and was last responsible for Technical Service for Metallurgy and Processing Lines. Alexander Heck transferred to SMS subsidiary elexis AG as Chairman of the Board.

On July 1, 2023, Thiago Turchetti Maia will follow Bernhard Steenken as Head of SMS digital. In his current position as CEO of Vetta Tecnologia, Thiago Maia already is a core manager of SMS group's integrated life cycle services. Bernhard Steenken has been appointed as new CSO for the Region India & Asia Pacific. He will take over the position of Pino Tesè, who will retire by end of this year.



SMS wins supply chain management award

In October 2022, SMS group received the German Award for Supply Chain Management for its BOXBAY logistics technology at a ceremony held as part of the International Supply Chain Conference. BOXBAY offers an innovative solution to some critical challenges in container port logistics. The system is a game changer for future ports by combining economic goals with environmental targets.

Burkhard Dahmen, CEO of SMS group: "We are very proud that our BOXBAY technology convinced the jury. The award also represents a huge success and motivation for the whole team. BOXBAY can make container handling in ports much more efficient while, at the same time, contributing to the decarbonization of supply chains."

With BOXBAY, the containers are stacked up to 11 levels high in a fully automated high-bay storage system. This allows direct access to every single container. At the same time, BOXBAY can offer up to three times more capacity and efficiency than conventional storage systems, where containers often have to be reshuffled several times. Thanks to full automation and digitalization, the quayside transshipment speed can be increased by up to 20 % – a significant economic advantage for the very cost-intensive container shipping sector. A photovoltaic system on the roof of the storage system means that BOXBAY can also be operated in a CO_2-neutral mode.



BOXBAY goes South Korea

In March 2023, the first official order for BOXBAY was made public: DP World announced the commercial use of the revolutionary high-bay storage system for its terminal in Busan, South Korea.

Sultan Ahmed Bin Sulayem, Group Chairman and CEO of DP World, and Burkhard Dahmen, Chairman and CEO of SMS group, signed the contract between DP World subsidiary Pusan Newport Corporation (PNC) and BOXBAY in the visitor center of the BOXBAY pilot facility in Jebel Ali Free Zone, Dubai.

PNC already operates one of the highest-performing container terminals in Asia. The addition of BOXBAY's technology will help PNC to boost its efficiency even further. The system will eliminate 350,000 unproductive moves per year. DP World also intends to power it by using solar energy, generated by photovoltaic panels on the roof of the storage system.

Burkhard Dahmen, CEO of SMS group: "The BOXBAY system combines economic advantages with environmental targets and is set to be a real game changer for the ports of the future. We are very proud that our joint venture has now received its first commercial order from an industry customer. SMS group's mission for over 150 years has always been to apply our experience and innovational spirit to the metals industry. With BOXBAY, we are able to highlight the fact that, with our extensive engineering and project expertise, we are also able to set standards outside our core business."

SMS group originally developed the high-bay storage system to handle metal coils weighing up to 40 tons. Stored in shelving systems up to 50 m high, these coils can be automatically moved in and out. DP World and SMS built a BOXBAY pilot facility at Jebel Ali's Terminal 4 in January 2021. To date, more than 200,000 container movements had been carried out under realistic operating conditions to verify the market maturity of the system.

news





Upgrade of workshop in India

SMS group expanded its Indian workshop in Bhubaneswar with three new machines. A CNC horizontal boring machine enables us to cope with the increasing demand for machining mid-sized frames and caster segments. The new CNC bed-type milling machine will be used for machining small components like bearing housings or brackets. We added a state-of-the-art spray and fuse coating facility to increase thermal spray coating capabilities. This unit focuses on looper rolls and roller table rollers that require fuse coating on their barrel diameter.

Primobius: From pilot system to continuous commercial operation

Primobius, SMS group's joint venture with Australian Neometals, has put its demonstration plant for recycling lithium-ion batteries in Hilchenbach into commercial operations. It is now offering its first disposal recycling services. With this plant, Primobius allows customers 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 oxides) from consumer electronics or electric vehicles in a sustainable manner.

Any residual charge in the batteries can be removed at two unloading stations integrated into the process. Dismantling work required for larger modules is performed at newly set-up stations before the individual cells are removed and shredded.

Currently, cells from the automotive industry are mainly shredded in a two-shift operation. Packaging components such as plastic, metal sheathings, and foils are separated to obtain the so-called black mass, which contains valuable raw materials such as nickel, cobalt, and lithium. The final product resulting from mechanical comminution and beneficiation is a mixed material fraction consisting of copper, aluminum, and plastic parts with different compositions depending on the feedstock used.

SMS celebrates ten years of success in Bahrain

In the past ten years, the office in Bahrain transformed from its humble beginnings in 2012 when it was just managing a warehouse for SULB Bahrain, to a full-fledged operation supporting and servicing SMS group customers in ten countries. Sigi Gruber, Managing Director of SMS Technical Services Gulf: "Thank you to a fantastic team and their collaboration with all other SMS group colleagues. We look forward to many more years of successful business."

New joint venture: CATALYTIC Power Solutions

Producing valuable energy from climate-polluting gases – this is the innovative approach taken by CATALYTIC Power Solutions GmbH, a new joint venture between SMS group and Bremen-based company KAEFER. The company is marketing a patent-pending technology that utilizes waste gases as fuel with the aid of a power-induced catalytic combustor.

Operators of waste disposal sites or biogas plants are prohibited from allowing the methane created during the biological decomposition of waste to be discharged uncontrolled into the atmosphere. This is because methane (CH_4) is about 28 times more harmful to the environment than CO_2. That is why it needs to be burned off with additional 'good gas' in a cogeneration plant or by means of a flare. This is where CATALYTIC Power Solutions comes in. The catalytic combustion chamber is where low-calorific gases are flamelessly transformed into the significantly less harmful CO_2 and, in combination with a gas turbine, also generates electrical and thermal energy at the same time. The waste heat generated in the process can be used for drying purposes as well as to obtain energy for processes. The technology already exceeds the requirements of European legislation governing the disposal of organic waste. Tests currently being carried out on the system in Bremen are already yielding successful results.

In terms of climate protection, this new development is a milestone in two respects. The catalytic reactor system not only uses harmful waste gases, which were not previously utilized, to generate heat and electricity, it also saves valuable good gas that up to now was required to burn off the methane.

Cutting-edge machines for LernWERK in Hilchenbach

Equipping apprentices for tomorrow's sustainable metals industry is the credo behind the training we offer at our locations in Germany. To make this promise a reality, we have now invested around one million euros in purchasing new manufacturing machines for our training center in Hilchenbach. The apprentices put the new high-end machines into service during a handover ceremony.



Groundbreaking of battery recycling plant for Mercedes-Benz

In March 2023, Mercedes-Benz AG laid the foundation stone for its battery recycling factory in Kuppenheim, Germany. Our joint venture Primobius is the technology partner in this important project, contributing to closing the recycling loop and reducing resource consumption in the electromobility sector.

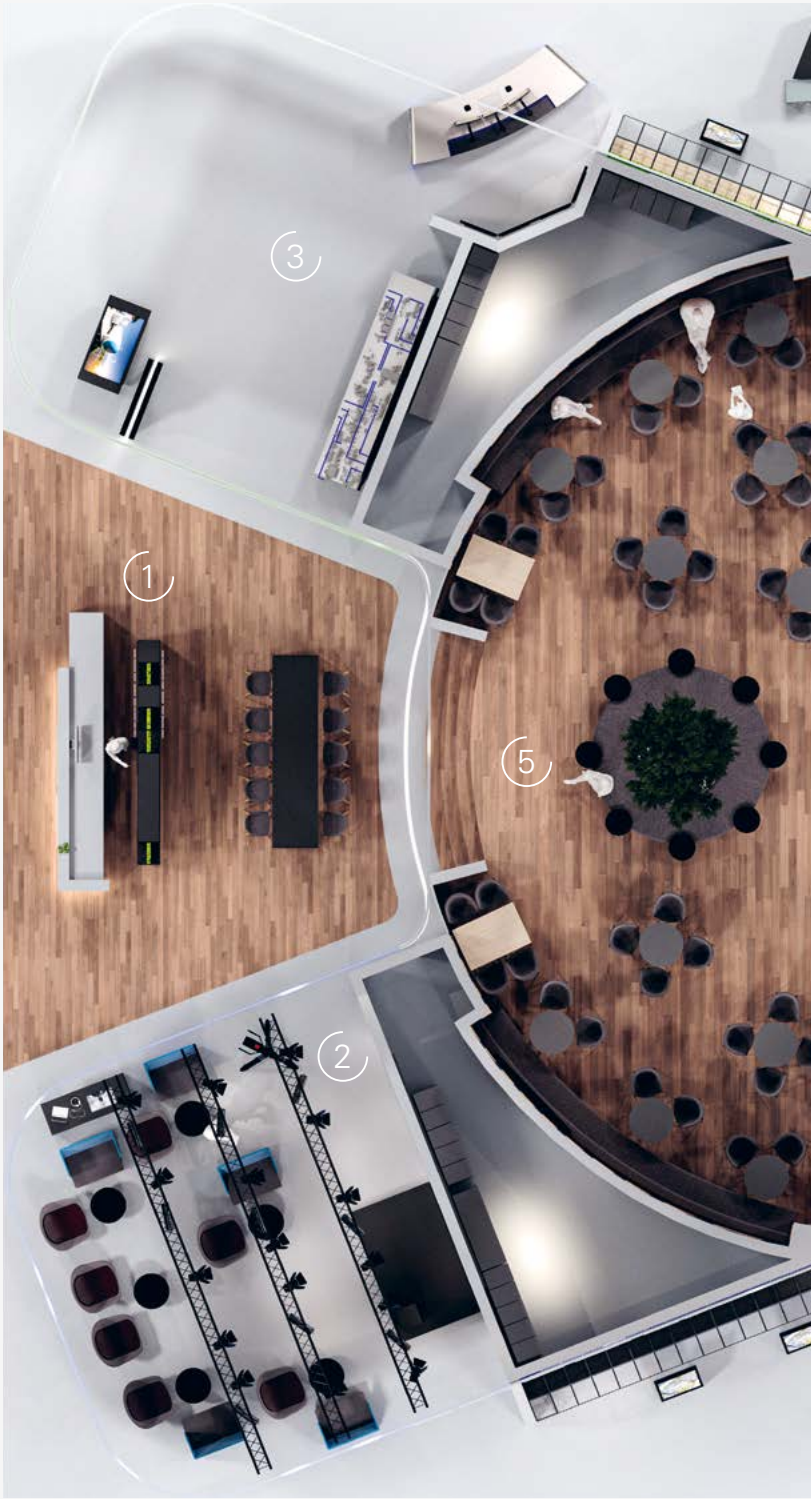
Jörg Burzer, member of the Board of Management of Mercedes-Benz Group AG with responsibility for Production & Supply Chain Management: "In terms of saving resources, Mercedes-Benz is pursuing a clear goal: as complete a circular economy as possible for all raw materials used. Sustainable battery recycling is a key factor in this. With our new recycling plant in Kuppenheim, we are consistently expanding our own expertise in battery value creation."

The direct integration of hydrometallurgy into the overall concept of a recycling plant is the crucial step in sustainable battery recycling, where the materials obtained can be ideally reused to produce new cells. Thanks to the technology of our joint venture with Neometals Ltd., Mercedes-Benz will be the first automotive manufacturer to operate its own recycling plant including hydrometallurgical treatment facilities, across Europe.

As Horst Krenn, Managing Director of Primobius, says: "The introduction of a circular economy can significantly enhance the CO_2 balance of lithium-ion batteries and shorten the time to achieve the 'CO_2 breakeven point' of electric vehicles. 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."

It’s METEC





1 WELCOME DESK

2 LEADING PARTNER TALKS

3 LIFE CYCLE PARTNERSHIP
including exhibit X-Pact® Lights-Out

4 GREEN METALS

5 PLAZA

6 150 YEARS OF SHAPING THE FUTURE

time!



From June 12-16, 2023, the heart of our industry will be beating again in Düsseldorf. Like every time, we have come up with something really special for our customers and partners. Our booth will be giving visitors a taste of what's to come on the SMS Campus in Mönchengladbach, which will be inaugurated this fall. Everything is arranged around the central plaza, which offers an enticing ambience for getting together and exchanging ideas and opinions.

The spotlight at METEC will be on #turningmetalsgreen and our solutions for sustainable and CO_2-neutral metals production. The second focal point is our integrated services, comprising automation, digitalization, maintenance, and operation services. Being a life cycle partner for our customers, we strive for a high-performance metals production with regard to plant availability, product quality, productivity, and safety.

What's more, our 'Leading Partner Talks' will again provide the ideal platform for interesting interviews and discussions on current projects, green technologies, and industry megatrends. Those who are unable to travel to Düsseldorf can also follow the Leading Partner Talks via our livestream.

At the same time as METEC, the Congress Center Düsseldorf will be hosting the 6th ESTAD conference, where we will be presenting new concepts and technologies in over 40 presentations and papers.

What else is new? Well, we've moved. You will now find SMS group and all subsidiaries at booth E40/41 in hall 1. And this year the fair starts on Monday already and ends on Friday.

See you at METEC!

For up-to-date information, schedules, and tickets, visit our trade fair website at:
www.sms-group.com/metec2023

Coming up – the next issue of our magazine

Looking back into the future

In the next issue, we will take a look at the past and the future of SMS group. In the fall of 2023, we will inaugurate our new SMS Campus in Mönchengladbach, embarking on a new era. Here, employees who previously worked in five different locations will come together under one roof to develop solutions for the green and digital future of the metals industry.

But the Campus will not only be a place of collaboration – it will also showcase the creative possibilities of metal as a building material. In fact, a large part of the rebars, beams, or sheet were produced on plants supplied by SMS group. The eye-catcher of our new home will be the membrane roof spanning the plaza in the center of the Campus with a diameter of 82 m – held in place by ropes made of high-strength wire.

We will use the inauguration of our new Campus as an opportunity to celebrate our 150th company anniversary with all employees worldwide, which we had to postpone in 2021 due to the COVID-19 pandemic. Following the motto '150 years of shaping the future of metals' the upcoming issue will reflect on groundbreaking innovations and successful projects, while also looking ahead into the future. ●

Curious to learn more about the architecture of the SMS Campus? Follow us on LinkedIn and read our series on the steel products used in the building: smsgroup-gmbh

1 | 5 | 0 YEARS of shaping the future

Imprint

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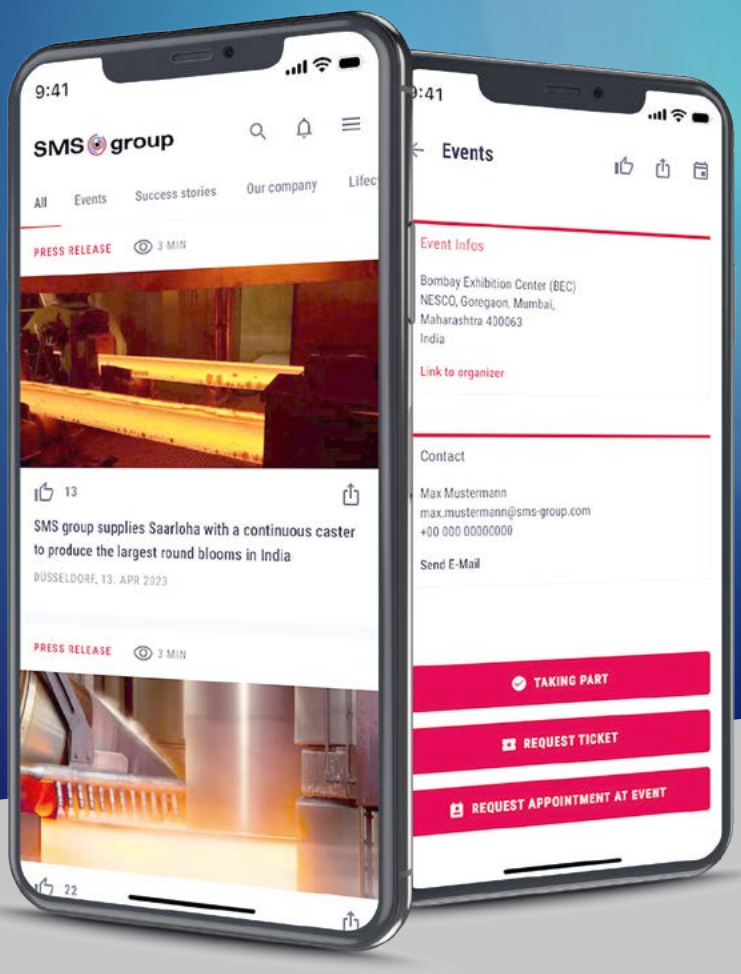
The information provided in this magazine contains a general description of the performance characteristics of the products concerned. The actual products may not always have the characteristics described and, in particular, these may change as a result of further developments of the products. The provision of this information is not intended to have, and will not have, legal effect. An obligation to deliver products having particular characteristics shall only exist if expressly agreed in the terms of the contract.

SMS group

Let's get connected



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