ANNUAL REPORT 2018

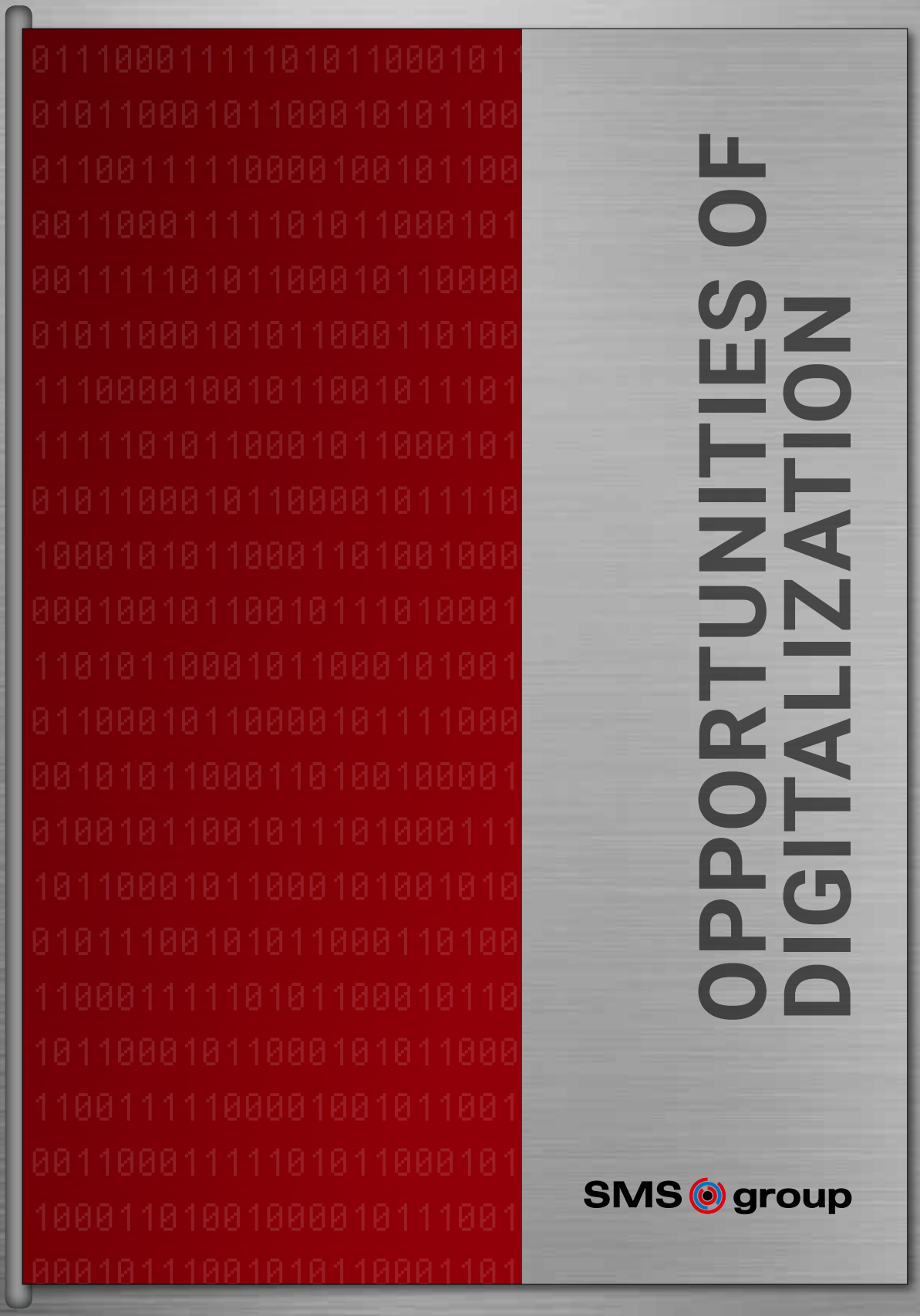
INSPIRED

LEADING PARTNER IN THE WORLD OF METALS

SMS group

DIGITAL TRANSFORMATION

Digitalization is an opportunity we are grasping together with our customers. Our brochure shows what concrete services we offer, what we consider especially important, and what strategy we are using to drive our internal digitalization.



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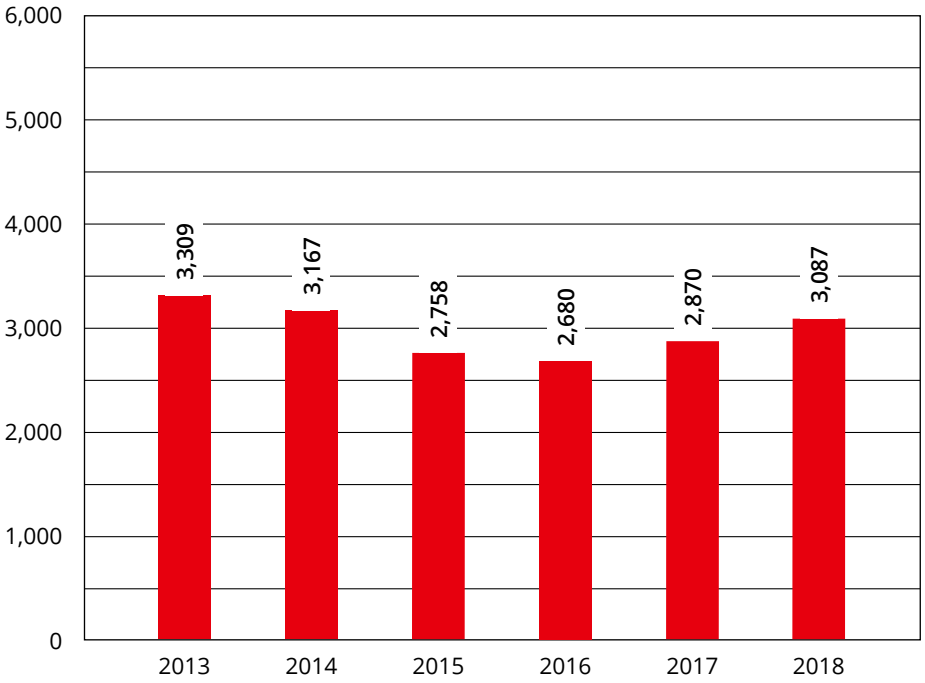


Order intake in EUR million[1)]

SMS group in EUR million[1)]	2013	2014	2015	2016	2017	2018
Order intake	3,309	3,167	2,758	2,680	2,870	3,087
Sales	3,495	3,406	3,310	3,052	2,887	2,805
Order backlog	4,997	4,613	4,018	3,566	3,472	3,623
Employees[2)]	13,856	14,003	14,342	13,903	14,305	13,872

Figures in accordance with International Financial Reporting Standards (IFRS).

[1)] Including others/consolidated.

[2)] Average with apprentices/others.

EXECUTIVE SUMMARY

STEEL AND ALUMINUM MARKET

Steel prices developed positively in 2018. Protectionist measures, in particular by the US and the EU, boosted the sales prices of hot strip and rebars. At present, prices in the US are on a high level. As a result, previously unprofitable plants were able to produce profitably again.

However, the problem of global overcapacities of around 30 percent remains unsolved and is depressing prices. Global steel production in 2018 was up on the previous year by approx. 4.7 percent. Growth was driven above all by increased production in Asia and the Middle East. India overtook Japan to become the second-largest steel producing nation. Once again, in 2018 every second ton of steel came from China. Due to the trade conflict, the export rate of the Chinese steel industry dropped to 7 percent.

Compared to the previous year, global primary aluminum production increased by 1.5 percent to 64.3 million tons. Here again, China is the main growth engine and by far the most important region for primary aluminum production. There were no significant capacity changes in primary aluminum production in all other regions.

MARKET SITUATION IN PLANT CONSTRUCTION

The market situation for metallurgical machine and plant construction in 2018 stabilized at a level comparable to 2017. The recovery in steel prices resulted in a slight upswing in inquiries. Despite this, overcapacities and fierce competition among suppliers is keeping machine and plant prices down to the same low level as in the previous year.

Customers are still very interested in modernizations, especially those designed to improve efficiency and quality. As a result, projects have generally become smaller and more complex. Also in demand are eco-friendly products and processes. These are increasingly gaining importance in emerging economies.

There is an increased demand for digital products such as Smart Alarm from SMS digital. This application is quickly scalable to various plant types – also outside the steel industry. In 2018, as part of the digitalization strategy, SMS created the foundations necessary for meeting increased demand in this area as well as for pooling the required know-how.

There is a special focus on continuously developing our service business. The trend toward out- →

sourcing maintenance services continued in 2018, and looks set to keep rising. The digital further development of our product portfolio to include e-services is an important step in increasing closeness to customers and accelerating order processing.

Beyond our core business, we are successfully expanding our product portfolio into adjacent markets with growth potentials. We bring together these growth topics under the name New Horizon. As a leading company in metallurgical plant construction, we can apply our vast experience in plant technology and process expertise here.

Particularly noteworthy is our joint venture with port operator DP World. Together with DP World, the SMS subsidiary AMOVA will build the first pilot plant for a new warehousing system for marine containers in time for the EXPO 2020 in Dubai.

In the field of additive manufacturing, we have successfully commissioned our own pilot plant for powder production. It produces high-purity metal powder for use in 3D printers.

ADJUSTMENT TO ALTERED MARKET CONDITIONS / COST-CUTTING ACTIVITIES

In response to the continued difficult market environment and unsatisfactory business result, we launched our Task Force 2021 transformation program in 2018.

Its main goals are the sustained strengthening of our core business and optimization of processes in a drive to improve our earnings situation. The individual divisions and the central functions have drawn up transition plans with more than 600 cost-cutting measures with an effect horizon of up to 2021.

Furthermore, important, inter-divisional topics will be tackled in "Central Projects." Cost cutting will focus above all on modularization and standardization of our portfolio, optimization of sales, order processing, and project management, and construction site organization.

Included here are measures to cut costs for personnel, materials, and overheads. We will continue to invest in innovations and develop new products so that our range consistently contains technologically sophisticated products.

FUTURE PROSPECTS 2019 / FORECAST

For 2019, the World Bank expects a slight decline in global economic growth after the high point at the beginning of 2018 appears to be over. It is anticipated that economic growth will weaken, above all in the US, to just +1.7 percent in 2020. Furthermore, the loose monetary policy of recent years seems to be coming to an end. This threatens a capital outflow from the developing economies, which will put the financial markets there under additional pressure.

In 2019, we must keep a close eye on developments resulting from trade conflicts as well as political topics such as Brexit, which will have far-reaching consequences for the global economy.

Once again in 2019, the metallurgical plant construction market will remain tense and price competition will be fierce for available projects. Global overcapacities are still depressing our new plants business. However, we expect continued positive development of our modernization activities. Vital to ensuring our competitiveness are cost optimization and greater efficiency as well as efforts to secure our technology leadership. That is why we are continuing and intensifying our work in this area. Apart from driving the continuous expansion of our service business and increasing digitalization, we are working hard on new business fields in our New Horizon strategy.

Looking at order intake prospects in 2019, we expect an almost constant result on the same level as in 2018. We anticipate a slight increase in group sales compared to the previous year. Due to the expected effectiveness of restructuring measures, the group's net result in the current business year should be significantly better, although still on a low level.

ORDER INTAKE

SMS group order intake in 2018 totaled EUR 3,087 million. This was EUR 217 million up on the previous year (2017: EUR 2,870 million). This means we exceeded our forecast of matching the previous year's order intake. Metallurgical plant construction generated orders worth EUR 2,812 million (2017: EUR 2,591 million). That was an increase of EUR 221 million compared to 2017. Business with plants improved to EUR 2,113 million (2017: EUR 1,907 million). Service business also continues to attract steadily growing orders. At the year's

end, the figure reached EUR 698 million, which was slightly above the order intake in the previous year (EUR 685 million).

elexis generated an order intake of EUR 222 million (2017: EUR 210 million). In contrast, Elotherm posted a significantly lower order intake than the EUR 73 million in 2017, generating just EUR 56 million in 2018.

SALES

At EUR 2,805 million, sales of SMS group in the past business year were EUR 82 million below the previous year's level (EUR 2,887 million). This confirmed our forecast of a slightly lower sales result.

Sales in metallurgical plant construction were EUR 2,517 million, which was below the previous year (EUR 2,638 million). Sales from plant business continue to decrease and amounted to EUR 1,842 million (2017: EUR 1,977 million). Sales in service business are steadily growing and amounted to EUR 675 million (2017: EUR 660 million).

This is how SMS group sales broke down according to global regions:

- Asia: 33 percent (2017: 33 percent)
- Europe: 31 percent (2017: 31 percent)
- America: 20 percent (2017: 25 percent)
- Africa: 10 percent (2017: 4 percent)
- Russia: 6 percent (2017: 7 percent)

elexis generated sales totaling EUR 208 million, which exceeded the previous year's figure (EUR 193 million) by EUR 15 million. Sales by Elotherm (EUR 78 million) improved compared to the previous year (2017: EUR 57 million) by EUR 21 million.

ORDER BACKLOG

Due to an order intake higher than sales, the order backlog, at EUR 3,623 million, is slightly above the previous year's figure (EUR 3,472).

EMPLOYEES

In the 2018 business year, SMS group had an average of 13,872 employees (2017: 14,305). That corresponds to a decrease of 433 employees on the previous year.

The number of employees at elexis/Elotherm was 1,562, on a level with the previous year (2017: 1,566).

RESULT

In the 2018 business year, SMS group generated a net result of EUR 27 million, which was slightly higher than the previous year (EUR 23 million). Therefore, we succeeded in fully meeting our forecast of a significantly improved pretax result compared to the previous year.

The equity ratio of 20.5 percent is higher than in 2017 (18.8 percent).

LIQUIDITY

Compared to the previous year, cash and cash equivalents were down by EUR 103 million to EUR 685 million (2017: EUR 788 million).

In addition, we also hold securities from current assets with a market value of EUR 277 million. After deduction of financial liabilities of EUR 78 million, this results in net liquidity of EUR 884 million (2017: EUR 1,076 million).

INVESTMENT

The investment volume in intangible assets and property amounted to EUR 38 million (2017: EUR 81 million). Investments essentially went into a powder atomization facility as well as the expansion or replacement of existing IT systems.

We invested EUR 55 million in other business interests and investment securities (2017: EUR 66 million). That compares with proceeds from the disposal of financial assets totaling EUR 18 million (2017: EUR 25 million).

The advance payments received that are customary in the industry are secured by bank guarantees. The proportion of guarantee and borrowing facilities utilized is approx. 50 percent. ●

Burkhard Dahmen,
Spokesman for the Managing Board, SMS GmbH

Torsten Heising,
Member of the Managing Board, SMS GmbH

Dear business partners,

Another year of SMS group's consequent focus on future technological and market-specific requirements lies behind us. After several years of consolidation, order intake and earnings have increasingly stabilized and we were able to achieve and, in some cases, exceed the set goals for the financial year.

Overall, 2018 was a good year for the processed materials markets. It was only around the transition into 2019 that the economic outlook deteriorated. Protectionist tendencies in international trade with high tariffs in some cases, structural changes in the automotive industry, "BREXIT" and political tensions in specific regions are the main causes of increasing uncertainty in global supply chains. Whether these developments will lead to a sustained investment restraint can be better evaluated throughout 2019.

For our SMS group, it was essential to fully implement the comprehensive package of measures for all corporate divisions in Germany and abroad. The core of the program was to strengthen the competitiveness of our German locations. Based on an open discussion with the employees, we implemented a binding future contract in an impressive manner. The trusting cooperation deeply rooted in our corporate culture is a crucial foundation for this success.

In parallel to increasing efficiency and optimizing business processes in the company, significant progress was made in implementing the strategic future and growth topics.

Our new in-house start-up SMS digital has proven a particularly effective addition to our group. New projects for the "learning factory" of our customers and our internal digital transformation form the basis for market leadership in 4.0 solutions in the materials industry.

Another key milestone for growth and innovation was Paul Wurth's investment in Sunfire. With the introduction of high-temperature electrolysis, SMS group will contribute significantly with direct reduction technology to reduce the carbon footprint of the steel industry in the coming years. This technology leap also opens new, fast-growing markets for nonferrous metallurgy and zero-emission processes for environmental and recycling technologies. This opens a particularly promising area of strategic growth: a sustainable circular economy of raw and processed materials.

In order to master all the challenges of the core business, the innovative digital and service-oriented products as well as the technological growth areas, the structural and operational organization has been consistently developed. The focus on innovation of our core products in mechanical and plant technology will greatly enhance performance and competitiveness. The program of measures to improve project management, from engineering to site management and commissioning at the customer, has already had a positive effect in the past year. Together with the comprehensive digitalization of all processes for product creation and project implementation, a dynamic platform for the future increase of our company's value is established.

At the same time, the close integration of "product," "project," and "process" was consistently portrayed in the new distribution of tasks of the management.

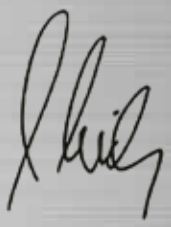
The measures introduced in recent years are now taking effect. They define the strategic orientation of SMS group in the next decade. The further development of the product and service spectrum for the global markets aims to reduce cyclicality and to strengthen profitability in order to create the basis for extensive investments in this future.

Employees and executives stand together for this challenge on the firm foundation of our corporate culture of partnership. All have impressively demonstrated flexibility and the ability to adapt to changing market situations with team-oriented solutions.

On behalf of the Supervisory Board, I especially thank all our employees for the work they have accomplished during the financial year. To our global business partners, I say thanks for their cooperation and loyalty to our SMS group.

Raw materials and materials are the basis for technology and business – together we create the most innovative solutions and we remain "The Leading Partner in the World of Metals."

Yours sincerely,

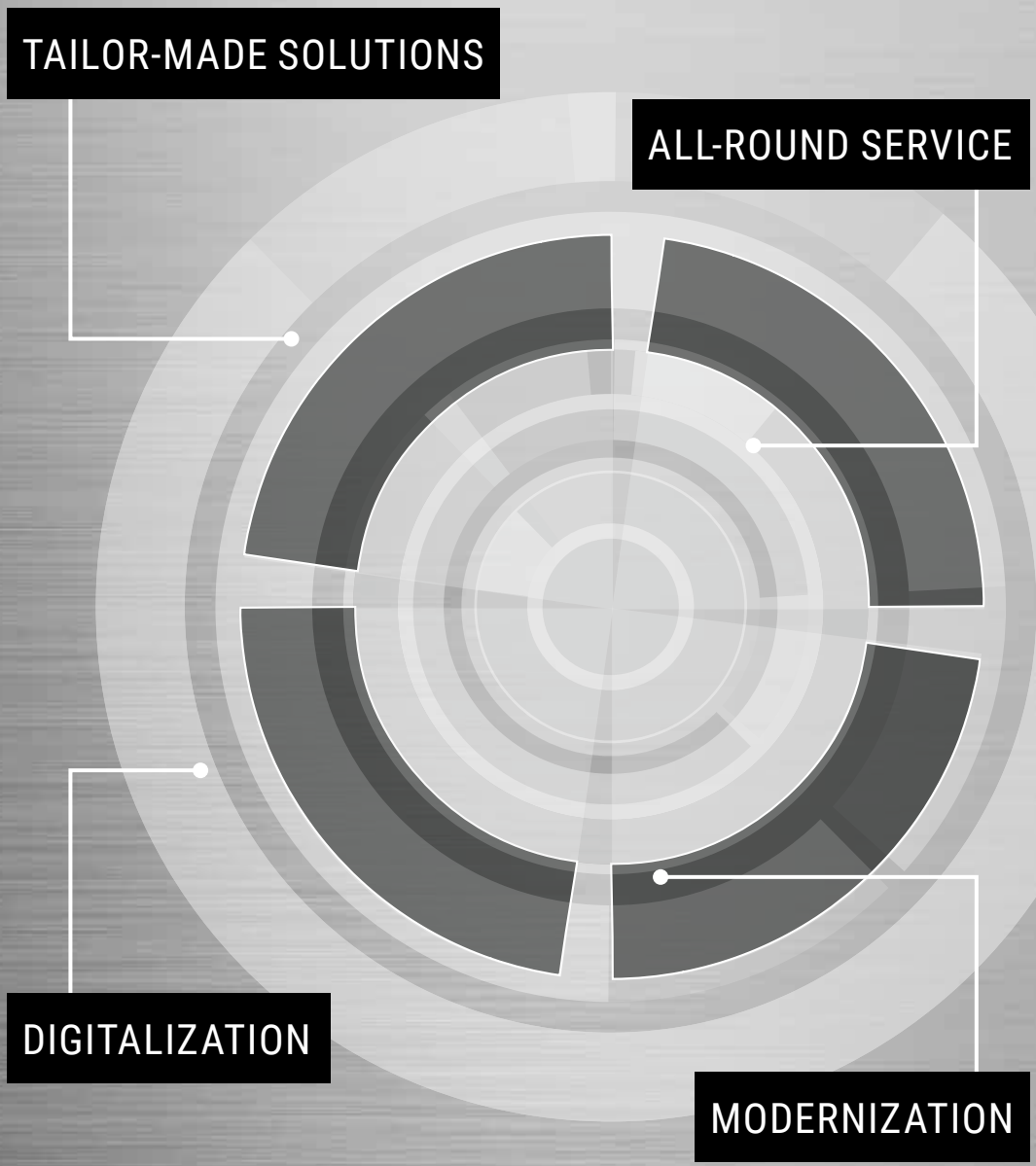


Edwin Eichler,
Chairman of the Supervisory Board, SMS GmbH

LEADING PARTNER IN THE WORLD OF METALS

OUR VISION – OUR FIELDS OF ACTIVITY

Our aim is to be the global leading partner for the metal industry. We believe it's our duty to support the success of our customers along the entire value creation chain. Quickly, flexibly, and reliably, we develop custom, state-of-the-art solutions so our customers can successfully focus on their core business. We do this in four key fields of activity:



"SUCCESS DEPENDS ON OUR TRANSFORMATION."

The steel industry is undergoing a transition. In this interview, our chief officers talk about how they are meeting market challenges, what opportunities they see, and what global megatrends have to do with the future direction of SMS group.

TAILOR-MADE SOLUTIONS

We offer our customers turnkey holistic solutions for innovative plant technology. All this comes in a complete package including buildings and infrastructure, tailor-made logistics, and the necessary auxiliary facilities.

DIGITALIZATION

Applying the latest innovation methods, metallurgical process know-how, and technology expertise, we develop new digital products that sustainably contribute to our customers' success.

MODERNIZATION

Drawing on our many years of experience and valuable knowledge, our modernization experts revamp yesterday's plants so they meet today's technology standards. They accomplish these results precisely and efficiently.

ALL-ROUND SERVICE

Technical service from SMS group is available at more than 50 locations worldwide. Our specialists provide highly effective service packages tailored to our customers' needs along the entire metallurgical process chain.

WHAT WERE THE GREATEST CHALLENGES FOR SMS GROUP IN 2018?

Burkhard Dahmen: The market we operate in is becoming more challenging than ever worldwide. On the one hand, it rewards the best and the boldest, on the other hand, it punishes those who aren't willing or able to move with the times.

Torsten Heising: In general, SMS group is on course to get back to our former strength. Financially, we are gaining ground, and if we maintain our discipline and commitment to our Task Force '21 program, we'll achieve our goal of profitable growth and an operating result of seven percent.

Prof. Dr.-Ing. Katja Windt: Digitalization in the metals industry is certainly one of the major innovation drivers for the future. At an early stage, and in dialog with our customers, we started creating groundbreaking and innovative solutions in this area. Today, we already offer new products and services based on digital technology that can significantly boost our customers' efficiency.

Prof. Dr.-Ing. Hans Ferkel: SMS group has also defined its goals in other areas as well. When you enter new territory, you have to try especially hard to keep up. But that doesn't put us off. The latest examples are our investments in green steelmaking, the production of e-fuels, and the utilization of waste heat from steelmaking. →

AS "THE LEADING PARTNER IN THE WORLD OF METALS," SMS GROUP CONSTANTLY SETS NEW BENCHMARKS FOR THE ENTIRE INDUSTRY. WHAT WERE THEY IN 2018?

Michael Rzepczyk: One highlight was definitely the commissioning of the world's most powerful and modern pull-down hydraulic closed-die forging press for the OTTO-FUCHS-Group at its Weber Metals location in California. SMS group used some 9,000 tons of steel in its construction. That's a totally new dimension for the future of forging.

Shandong Iraeta also set a new record thanks to us: Its newly developed ring rolling machine can seamlessly roll rings up to a diameter of 16 meters.

Prof. Dr.-Ing. Hans Ferkel: Paul Wurth's participation in Sunfire GmbH is a significant move. The company develops and manufactures high-efficiency electrolysis and fuel cells. This is one way we are getting ready for the imminent transition of the steel industry to CO_2-free steel production. Hydrogen will play an important role in the future.

We are also proud of the development of a completely new design for spray heads used to cool dies in forging presses. The design, engineering, and use of 3D printing won it the German Design Award.

Prof. Dr.-Ing. Katja Windt: For a customer in Canada, we equipped an entire steel mill section with a new process optimization and planning system based on our X-Pact® process guidance solution. Big River Steel in the US and Shandong Iron & Steel Group Rizhao in China are further examples that show how we can digitalize the complete value creation chain from liquid metal to the finished product.

In the field of port logistics we achieved an impressive advance. Together with DP World, we are developing a new, intelligent storage system for containers. Each container is stored in its own bay, yet is freely accessible at all times without the need to move any other container. This increases speed, energy efficiency, and safety while slashing costs.

WHAT ARE THE TOPICS SMS GROUP FOCUSED ON MOST IN 2018?

Burkhard Dahmen: In all our business activities, figures undoubtedly play an important role. Thanks to a consistently strong order situation, SMS group was able to maintain its financial independence.

Technical service remains a focus for us because it forms the heart of our partnership with our customers. As our attention to megatrends shows, we are also tackling future topics such as digitalization, environmental protection, and New Horizon.

Michael Rzepczyk: In 2018, we started to focus on tighter project management – this effort is also reflected in our Task Force '21 initiative. Projects are increasingly becoming smaller in scale, more complex, and more price-critical, so discipline in their processing is crucial. Important here are software and tools that help maintain a clear view of project-relevant aspects and interpret them correctly. That means project managers can detect and remedy any problems at an early stage.

"The changing market makes demands on us that we must face up to."

Torsten Heising,
CFO, SMS group GmbH

"Technical service forms the heart of our partnership with our customers."

Burkhard Dahmen,
CEO, SMS group GmbH

TASK FORCE '21 IS A TRANSFORMATION PROGRAM THAT AIMS TO STRENGTHEN OUR CORE BUSINESS. WHAT IS THE IDEA BEHIND IT?

Torsten Heising: The changing market makes demands on us that we must face up to. So we need to introduce new methods in the company that not only improve project processing but also cut costs. The various measures are being tackled in central projects. These define the frameworks and the responsible managers who focus on implementation.

THE PROGRAM IS DESIGNED TO INCLUDE ALL EMPLOYEES. YOU YOURSELVES ARE INVOLVED AS SPONSORS OF THE PROJECT. IS IT ALSO ABOUT STRENGTHENING THE CORPORATE CULTURE?

Torsten Heising: Yes, absolutely. We want all employees to be actively part of the transformation program. Because if they help shape this process, they are more likely to support the decisions made. That also means anchoring new methods and ways of working in practice.

Prof. Dr.-Ing. Hans Ferkel: That's why it's important to us that the employee interests that the Works Council distilled from the employee survey become part of the program. We take our employees' criticism very seriously and want to achieve improvements together wherever there are difficulties.

WORKING IN PARTNERSHIP REMAINS A PRIMARY ASPECT OF OUR COOPERATION WITH CUSTOMERS OF SMS GROUP. HOW FAR CAN THAT BE IMPLEMENTED?

Michael Rzepczyk: We have very good experience of this because we believe good cooperation only works on an equal footing, on the basis of partnership. We ensure a direct exchange with the customer to find out which specific solution is best in each case. The initial situation and the requirements are different from customer to customer. We take this into account every time.

Burkhard Dahmen: And we continue to take our position as the Leading Partner in the World of Metals very seriously. It's directly connected with the four megatrends we turned our attention →

"Good cooperation only works on an equal footing, on the basis of partnership."

Michael Rzepczyk,
COO, SMS group GmbH

to in 2018. They show how changes will shape the future of society and what market developments we need to be ready for. Ultimately, our focus on megatrends gives us the instruments that will help us retain our market leadership in the future.

Torsten Heising: The megatrend urbanization is all about the growth of cities. Especially in large cities, building construction will have to meet higher requirements, and this demands even better materials. The steel industry must upgrade its equipment to meet this challenge. A good example is Maanshan Iron & Steel in China. With its flexible section mill, it can produce not only heavy but also ultra-heavy jumbo beams. They are necessary for the construction of especially tall buildings.

Prof. Dr.-Ing. Katja Windt: Digitalization and the related area of Industry 4.0 are today's main development fields. Intelligent interconnection of data and machines provides the basis for added value creation. Our electrical and automation system solutions provide the vast volumes of data that are essential for extensive digitalization. To successfully support connectivity, we are developing new networking expertise for our customers as well as a holistic and systematic understanding of the current and future digital transformation.

Michael Rzepczyk: Mobility takes many forms. Rail, road, water, and air. Decisive for fast transport vehicles are lightweight materials. So it's no wonder the demand for aluminum is growing. Thanks to two new electric submerged-arc furnaces, Press Metal Berhad, South-East Asia's leading aluminum producer, has optimized its silicon production. This is a key element in aluminum alloys.

Prof. Dr.-Ing. Hans Ferkel: Sustainable plant operation is increasingly important in the steel industry. For a long time, we have been designing efficient solutions that reduce environmental impacts. One example is the revamp of the gas cleaning plant at Uddeholm AB in Sweden. Now, the plant extracts waste gases much more effectively, and no hazardous substances are generated during scrap drying.

"Our digitalization strategy aims to use data to create new value for our customers as well as within SMS group."

Prof. Dr.-Ing. Katja Windt,
CDO, SMS group GmbH

WHERE IS SMS GROUP HEADED IN THE FUTURE?

Prof. Dr.-Ing. Katja Windt: We have successfully developed and launched our digitalization strategy. Now we need some time to explain and discuss it internally. When we look at the opportunities offered by digitalization, we are not only thinking of major projects. We also implement our digital products even in small projects and revamps. And it's especially important to us that every customer can create its digital future with us.

The future success of our digital products and services portfolio also depends on our transformation into a digital company. We have a clear strategy and roadmap for improving our IT landscape and process quality. It will be implemented step by step, and will make our SMS group fitter for tapping into digital potentials now and in the future.

Burkhard Dahmen: Due to our current efforts, we are very optimistic. Driving ahead without our digitalization offensive, marketing our current and future New Horizon innovations, and acquiring valuable additions where they make sense makes us well placed to retain our leading position. We are confident this is how we'll remain successful in our innovation-driven core business of sales, engineering, and service.

"Sustainable plant operation is increasingly important in the steel industry."

Prof. Dr.-Ing. Hans Ferkel,
CTO, SMS group GmbH


INSP

We draw inspiration from global trends and developments. These ideas are also reflected in our cooperation with customers. We always think one step ahead when it comes to creative solutions that help meet the global challenges of the future.

We know: Metal will build the future and is an essential driver of global megatrends.

As a company, we assume responsibility and help turn megatrends into reality. This is one way we ensure we are the "Leading Partner in the World of Metals" for our customers. Worldwide.

THE CHALLENGE OF MEGATRENDS

How will we live in 20 years' time? What will occupy us in daily life, what will workplaces of the future look like? These are questions nobody can answer with certainty right now. But there are ways of gaining a better insight into social change. Market researchers have studied this area intensively and identified global megatrends. They highlight what has long influenced us and society, and what will shape us in the future.

Megatrends show how the world is changing. Especially as an internationally operating company, we know how important it is to look beyond narrow horizons and take these developments into account. In 2018, we focused even more on current megatrends to back up our long-term strategy of sustained growth.

Out of all the megatrends, we identified four as particularly relevant for our work as a partner in the metal industry. We see them as an inspiration for our work.

Urbanization is about building cities and is a key area that makes increasing demands on materials. There is a similar situation in the field of mobility. People are on the move more and more, and they want their journeys to be safe, clean, and fast. Steel, aluminum, and electrical sheet metal for the construction of cars, trains, and planes must meet the very highest standards.

The next megatrend, sustainability, is driving a change of attitude, especially in our industry. Steel production must become greener. We are already ahead of the curve here, because for decades our research and development activities have been making our plants ever more efficient and developing new solutions. Our slogan "Achieving more with less" reflects our goal of eliminating CO_2 emissions. An important key to this is hydrogen technology.

Process optimizations are at the heart of connectivity, the fourth megatrend. However, connectivity only works on the basis of homogenous data. This is the first step toward successful digitalization. At SMS group, we are constantly examining the opportunities and technologies in this area. That is why we have produced a special brochure all about digitalization.

Naturally, today's megatrends also affect the markets as well as supply and demand. Our all-round awareness of these developments means we can offer our customers the optimal solutions for their needs complete with implementation in close cooperation with them. Ultimately, you benefit because we respond to megatrends. That's because we can only build or revamp systems fit for the future if we know what tomorrow's markets will demand.

Understanding the global megatrends helps us further develop our expertise in the right direction. This means we can support our customers, as their "The Leading Partner in the World of Metals," so they are ready for the future.

Burkhard Dahmen,
Spokesman for the Managing Board, SMS GmbH

2018

MEGA TRENDS

URBANIZATION

CONNECTIVITY

MOBILITY

SUSTAINABILITY

URBANIZATION

The basis | High requirements of steel as a production material
The challenge | Multiple benefits in one product
The process | Developing technologies and establishing them on the market
The benefit | Experience makes us a strong partner
The vision | Huge steel beams for exceptional projects

"DUE TO GROWING CITIES, WE NEED TO LOOK AT THE USE OF STEEL DIFFERENTLY."

Higher, bigger, louder – the world's cities are growing inexorably because more and more people are drawn to vibrant big-city life. Limited space means that cities are, above all, growing vertically. Imposing skyscrapers are rising from the smallest plots. Both the planning and the construction materials for these projects have a completely different level of importance than for conventional buildings. What's more, the infrastructure must be able to cope with the extra load.

With this rapid development, urbanization also impacts on the steel industry. As the construction material of the future, steel must meet high requirements. At SMS group, we are constantly aware of these requirements and take account of them in our work. Included here is, for example, the development of new steel grades, surface technologies, or forming methods.

Thomas Maßmann,
Vice President, Long Products

"Megacities are cities with significantly more than 10 million inhabitants, and the greatest growth is in Asia. Because space is tight, we need creative ideas. At the same time, buildings in these regions have to be earthquake-proof and easier to build," explains Thomas Maßmann, Vice President, Long Products. He adds:

"Both these factors mean that we need to look at the use of steel differently. Especially as buildings get taller, at some point you leave the realm of reinforced concrete and enter the world of self-supporting structures."

That's why not only conventional reinforced concrete, but also many more steel products are used in construction today. Examples are steel sections or welded tubes. To increase the strength of construction steel, there is a trend toward lower-temperature rolling and tempering during the process. That is also reflected in the plants from SMS group. For example, we integrate cooling sections in rolling

HIGH-LOAD RAILS

With RailCool®, SMS group has developed a new process to temper rail ends in a heating process. This makes the rails more wear-resistant and capable of bearing heavier loads. That is an important property in curves and at points.

mills. Our TMbaR technology provides the same effect for rebars. "With this, we have developed a new technology for thermo-mechanical rebar rolling, and we are the first to launch it on the market," says Maßmann.

Another property steel needs for urban construction is corrosion-resistance. This is true especially because many large cities in Asia are near the coast. Maßmann sees this as a good opportunity for SMS group customers to establish themselves as suppliers of niche products and to process corrosion-resistant steels. "We have developed new coating processes for coating components or structures – also to reduce corrosion," adds Maßmann.

Other results of growing urbanization are changed and increasing requirements of mobility and transport of both people and goods. China is a good example: In recent years, the country has built a high-speed rail network that efficiently links cities. Maßmann says:

"Every meter of rail laid in China was produced on SMS group rolling mills. We are the world leader in rail rolling mills."

Today, the journey from Beijing to Shanghai is just as fast by train as by plane. Train travel is much more energy efficient, no more expensive, and very reliable. That also boosts sustainability. Now India has similar plans, and the rails there are also manufactured on rolling mills from SMS group. →

Europe and the US are also expanding and modernizing their infrastructure.

Supplying cities with power and water is another aspect that should not be underestimated, especially in regions where water is scarce. "The biggest challenge here is transporting water over long distances from dams in the mountains to the cities. Large pipelines are used for this. SMS group supplies solutions both for spiral and longitudinal-welded large pipes, which are used for these applications," explains Maßmann.

He believes the megatrend of urbanization will continue. Upcoming projects support his view:

"We have received orders for the world's largest heavy section mills. The huge steel beams they produce are used for exceptional infrastructure or high-rise building projects."

Examples from the recent past include the Burj Khalifa in Dubai and the Freedom Tower in New York – both superlative construction projects. The market for steel beams continues to grow. They are used not only for buildings, but also for rail tracks, bridges, pipelines, and road construction. With a vision for the future, SMS group helps ensure products can be manufactured that meet current and future requirements.

"URBANIZATION IS NOT JUST ABOUT URBAN GROWTH, BUT ALSO URBAN CHANGE."

Norbert Theelen, President & CEO, SMS group China

Grasping opportunities in urban construction

The city boom also has a major influence on steel producers themselves. Cities are growing so fast that steelmaking plants that were built far outside the city 15 or 20 years ago suddenly find themselves overtaken by urban sprawl.

The Chinese state has developed a program to relocate steel production and other industrial plants out of cities and into industrial parks. As a result, we are receiving more and more orders to relocate plants. Customers often use this opportunity to also revamp their equipment. When we attract relocation projects, we always offer newer, more efficient technology that is more eco-friendly.

Another part of the megatrend urbanization is transformation within cities. Old buildings are replaced by new ones, smaller buildings by large ones, and unstable buildings by quake-resistant ones. This means the demand for steel remains high. And it offers many opportunities for SMS group to contribute to the megatrend.

THREE SUCCESSES IN A ROW

SMS Concast in Zurich has attracted the third order in a row from Saarstahl AG. It consists of the construction of continuous caster No. S1. The company based in Völklingen is a world-leader in continuous casting technology and produces long products including ball bearing, spring, and Q+T steels. These products are used, for example, in the construction industry. Rolled wire and prestressing steel are important elements in bridge building, industry, housing construction, wind turbines, and railroad construction. To ensure an efficient production chain, Saarstahl AG relies on systematic quality improvement. The new continuous caster will produce 850,000 tons of billets per year and will be equipped with the latest technology. The proven plant concepts for the S0 and S3 were taken as the basis for the engineering, and where necessary they were altered to meet current requirements. The automation and communication in the plant will meet Industry 4.0 standards. The partnership-based cooperation between the two companies has paid off: SMS group and Saarstahl AG have been working together successfully for 15 years.

JUMBO BEAMS FOR CHINA'S CONSTRUCTION PROJECTS

When cities grow ever taller, the buildings need especially reliable and robust steel beams. The construction industry is responding to this trend and can rely on SMS group as a competent partner. With a new, flexible section mill, Maanshan Iron & Steel can now produce heavy and superheavy beams, known as jumbo beams. SMS group received the order from Magang Group, Ltd., China – and this was not the first project for the customer. SMS group has already installed 15 section mills for Maanshan Iron & Steel, the first in 1998.

There is a good reason for the expansion. The demand for heavy steel beams and sheet piles in China is growing steadily. This is no wonder, because there are more megacities in the People's Republic than in any other country in the world. The new section mill is designed for an annual capacity of 800,000 tons and equipped with the latest generation of universal mill stands. The individual components as well as the modern technology ensure top product quality. SMS employees will support both construction-site assembly and commissioning to ensure the project goes smoothly.

SUSTAINABILITY

Ecological considerations also played a role in the planning and implementation of the color coating line for ASAŞ.

- The bonding agents and the paint coat are each dried and hardened contactlessly in a low-emission strip flotation furnace.
- The solvent-containing waste gas from the coating section is cleaned using a regenerative afterburner system, and the energy recovered is channeled back into the system.

VARIATIONS FOR ALUMINUM FACADES

COLORS AND EFFECTS FOR THE CONSTRUCTION INDUSTRY

A colorful finish: SMS group attracted an order from ASAŞ Alüminyum Sanayi ve Ticaret A.Ş., based in the Turkish province of Sakarya, for a color coating line for aluminum strip. The process components include everything from the cleaning section to the back-up-roll coaters for color coating and strip flotation furnaces for drying and hardening paints. The coating line provides numerous coating options and fast color changing.

It also comes with a wide range of application options. Apart from aluminum strip, it can also treat steel strip in small cross-sections.

And the system can do more than apply a coat of paint. Also possible are special coatings such as wood grain effects to create aluminum cladding in a wood finish. The materials are mainly used in the construction industry, e.g., for facades or profiles and external blinds. They make sturdy buildings also look good in the details.

Further applications include consumer electronics and household goods.

INTERNATIONAL TEAMWORK IN BLAST FURNACE CONSTRUCTION

State-owned company Steel Authority of India, Ltd. (SAIL) is pursuing a long-term growth strategy in response to growing demand for steel in India. Therefore, in summer 2010, it awarded Paul Wurth and Larsen & Toubro a contract for construction of a new blast furnace for an additional production capacity of 2.8 million TPY of pig iron. In the Bhilai steelmaking plant in Chhattisgarh state, the ironworks previously consisted of seven medium-sized blast furnaces in Soviet construction type, which were built between 1950 and 1980. The new production unit for blast furnace No. 8 went on stream in February 2018.

As agreed in the contract, the project was completed on an EPC basis (engineering, procurement, construction) by a consortium consisting of Paul Wurth Italia, Paul Wurth India, and the Indian company Larsen & Toubro. Paul Wurth Group used its international organization to provide the necessary engineering, the locally sourced technology and equipment, and to provide construction site monitoring and the corresponding customer services.

With its volume of 4,060 cubic meters, hearth diameter of 13.4 meters, four tapping holes, and 36 nozzle holders, blast furnace No. 8 in Bhilai is the largest blast furnace Paul Wurth has commissioned in India so far. It is designed for a daily production of 8,030 tons of pig iron.

SHEET METAL PROCESSING WITH MULTIFLEX-QUENCH® TECHNOLOGY

These are the four steps of sheet metal processing in heavy-plate heat treatment using the latest technology:

1. Descaling in the shot blaster
2. Hardening and normalizing in the high-temperature roller-hearth furnace
3. Cooling with MultiFlex-Quench® technology
4. Tempering in the low-temperature roller-hearth furnace

The concept provides various options and models depending on the customer's wishes and production program. The flexible cooling option can support an extensive product portfolio.

PLATE COOLING STRATEGY

TECHNOLOGY FOR HIGH-STRENGTH HEAVY PLATE

What will the steel of the future be like? The material will have to unite properties such as increased strength, excellent toughness, good weldability, and perfect flatness. These requirements are no surprise considering the future applications. Especially high- and ultra-high-strength plate such as heavy plate is used in the growth industries wind energy and energy technology as well as for pipes, machine and crane construction. These grades are of course also in demand in the construction industry.

To fully exploit the potentials of steel, the following requirements are especially important in production: the process steps must be precisely coordinated with each other, and it should be possible to adjust the process parameters flexibly. Another crucial stage for setting the material properties is cooling.

That is why SMS group pays particular attention to these factors. With MultiFlex-Quench®, SMS has established a new technology for plate cooling in heat treatment lines. It works more flexibly, evenly, and with higher performance than conventional roll-type quenchers. The solution uses cooling strategies based on complex thermal online process models. Furthermore, it can produce both standard and special materials as well as newly developed materials with high quality requirements.

MultiFlex-Quench® was developed in 2015 as a further development of an already proven technology. In 2016, the first heavy plate was successfully produced with the new method in the Acroni plant in Slovenia. At the beginning of 2020, MultiFlex-Quench® technology will also be integrated in the new heat treatment line at Ilsenburger Grobblech GmbH. This means SMS group has established the new sheet cooling technology on the market and made a significant contribution to the production of high-strength steel for the urban construction and energy technology of the future.

CONNECTIVITY

The basis | Connectivity is the foundation for digitalization
The challenge | Unstructured automation processes
The method | From basic fix to sophisticated solution
The advantage | Twin expertise for profitable projects
The vision | A clean interface with customers

"WE ARE COMMITTED TO USER-CENTERED DEVELOPMENT."

Isolation spells the beginning of the end. That applies to companies, but also to each individual. In contrast, if you create and use connections, you can achieve great things. This idea is more relevant than ever, because the networking principle dominates current social change. The best example is social networks, which impressively demonstrate that information that can be shared brings people together.

In the business sector, networking has an even further-reaching dimension, as Bernhard Steenken, CEO, SMS digital GmbH, explains:

"Connectivity is the basis for everything – without connectivity there can be no digitalization."

Christian Geerkens, Vice President, Electrical and Automation Systems Division (left) and Bernhard Steenken, CEO, SMS digital

The SMS group subsidiary supplies the technology and solutions its customers need to digitalize their plants and operations. Yet the integration effort behind digitalization is frequently very high. It's a process often underestimated.

The great challenge SMS group employees face is the inhomogeneous automation landscape at customers' facilities, which partly results from a large number of interfaces. It means the data is also unstructured and inhomogeneous.

"To solve this connectivity problem, we have created a product named Data Factory. First, the customer collects unstructured data, then it is saved as smart data, in other words transformed into structured and homogeneous data," explains Steenken.

This premium data forms the basis for all further steps in the company's digitalization. It must be available so that software solutions can be developed and effectively applied.

Companies can only utilize the potentials of digitalization if they have structured data. →

WHAT CUSTOMERS WANT

- Completely digitalized internal processes to optimize their supply chains
- Process workflows improved by digitalization (quality, output, delivery times)
- Software rulebooks purchased from SMS group or written themselves
- Data-sharing or intentional avoidance

When developing digital applications, SMS group works in a totally user-centered way. That means involving the customer in the process right from the start. Both sides discuss, evaluate, and implement initial ideas together.

"When it comes to digitalization, it's not just about doing something better. The digital products must have a very concrete user benefit – that's our first priority," says Christian Geerkens, Vice President, Electrics and Automation Systems Division. Examples of a palpable benefit are increased product quality and improved output or delivery periods.

A well-structured procedure backs up the SMS group digitalization processes. Without it, Steenken and Geerkens both agree, the task would not be possible at all. Geerkens explains:

"Today, all customers are looking intensively at digitalization. Many conventional plant operators see it as a great opportunity."

However, due to the countless possibilities offered by digitalization, sometimes companies expect too much at once.

"Step one is always making the plant 'digital ready.' That means ensuring connectivity by creating structured and recoverable data. Then our advice to customers is: Start with the applications you already have and proprietary software solutions. This is a small investment that pays off very quickly," explains Steenken.

It enables companies to successfully achieve flagship projects. The next step up is individual software solutions or the integration of artificial intelligence.

„AT SMS DIGITAL GMBH, WE POOL OUR EXPERTISE ON DIGITALIZATION AND LINK IT WITH OUR PRODUCTS AND TECHNOLOGIES."

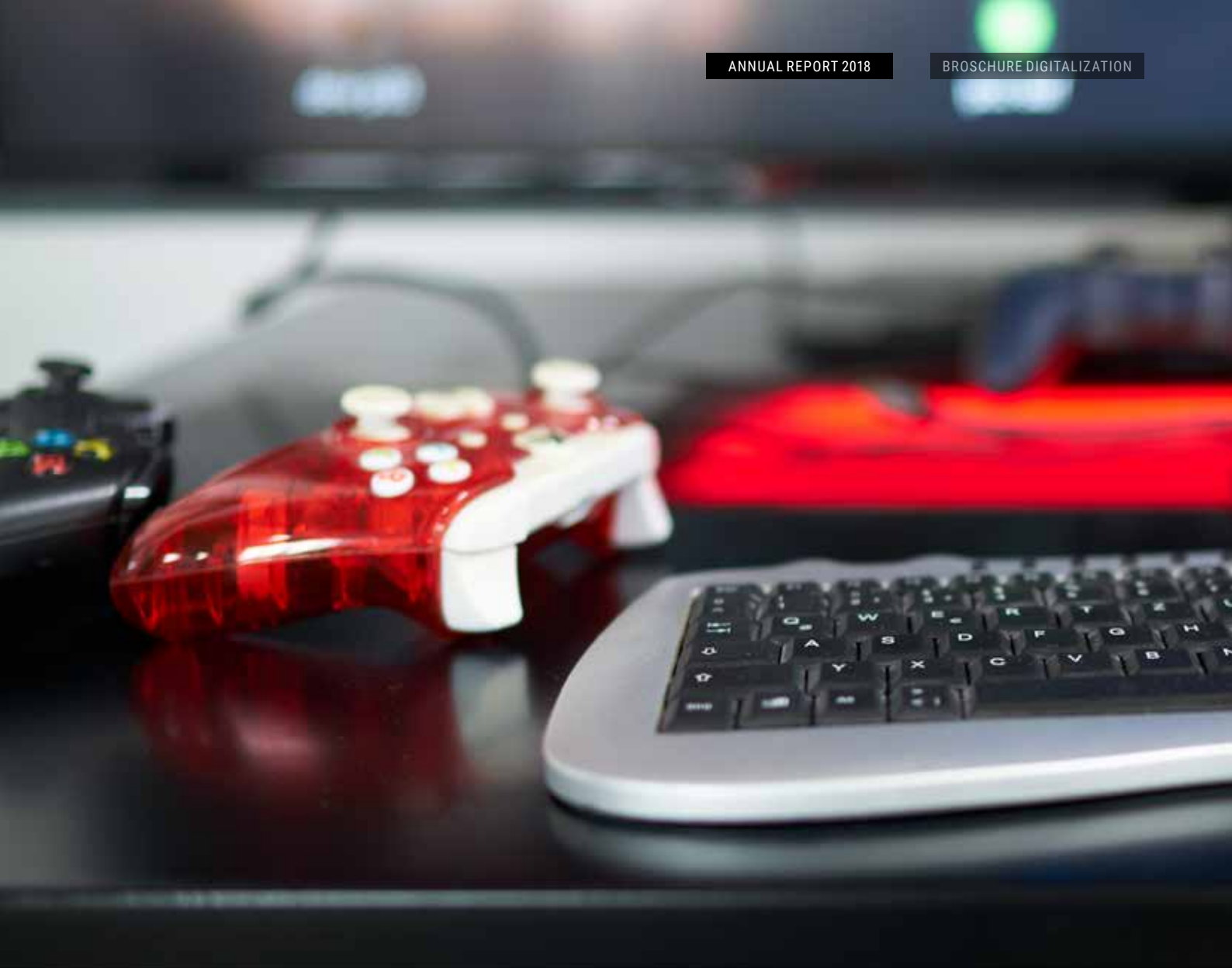
Prof. Dr.-Ing. Katja Windt, CDO, SMS group GmbH

Automation of processes

Apart from constantly further developing and optimizing our existing products, we also keep connectivity in mind when continually creating new, innovative solutions.

We are convinced that only the use of innovative yet mature sensor systems combined with smart electronics and software will fully meet future customer requirements. Intelligent, self-learning control algorithms will, in the future, process individual measurement data to optimize complete processes. A concrete example of this is the ongoing further development of our hotCAM into an intelligent automated mill stand control system.

At the same time, process automation is an important element of the megatrend connectivity, which is key to meeting our own performance standards.



This procedure not only makes sense with regard to step-by-step digitalization, but also as a way to win over skeptics. "Digitalization is fundamentally controversial because it divides two generations. So it's important to first achieve acceptance. And the best way to do that is with successful pilot projects," says Steenken. In other words, having a big vision and starting small.

When it comes to the effective use of artificial intelligence, SMS group stands out with its extensive competence. This comprises not only digital expertise, but also profound understanding of processes in the steel industry. "Linking these two together is what makes solutions really smart and efficient," says Steenken, and Geerkens adds: "We are the only company on the market to offer this combination. It's a decisive success factor for us."

The SMS employees can implement their process knowledge directly in the algorithms. For example, if a data specialist suspects there is a data anomaly in the process, the SMS group process experts can immediately spot that the cause is a phase change. As a result, the work is more efficient. "This is how we save customers a lot of money and provide a faster result," says Steenken.

Therefore, his formula for SMS group's success is: Digital expertise and process understanding lead to customer benefit – and ensure the customer reaches the desired goal.

"Linking digital expertise and process understanding is what makes solutions really smart and efficient." →

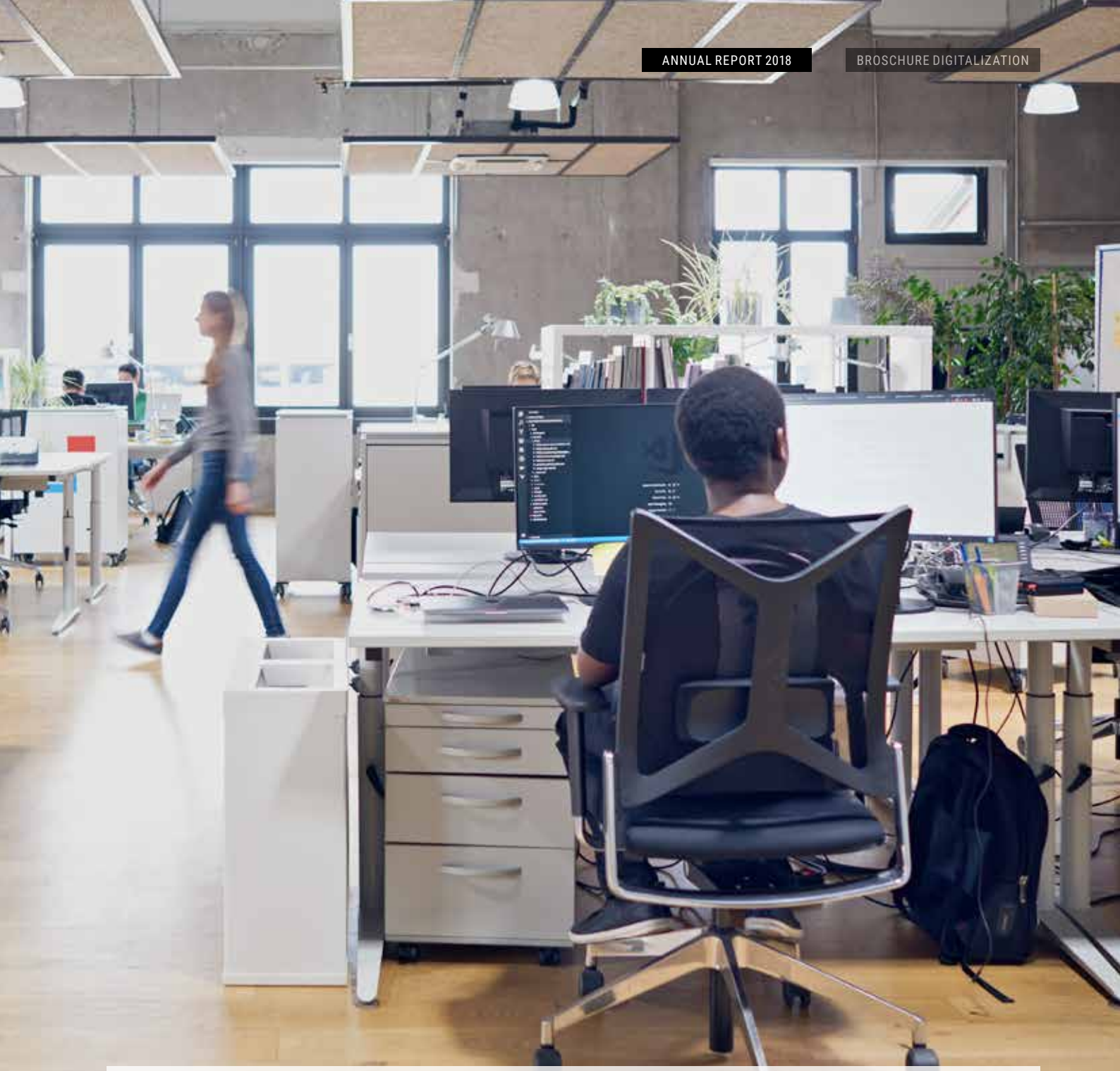
Looking to the future, Steenken expects connectivity to become the standard basis, so that advance preparation with the customer is no longer necessary.

"Whether the customer takes care of this itself or we create the basis jointly – my vision is that the customer has clean data and we have a mutual interface. Then we'll be able to easily provide apps the customer can try out," adds Steenken.

Geerkens also has clear ideas about how connectivity provides the conditions for future developments: A single system will link all the data belonging to a company in one database. The customer will have a choice of various platforms with applications it can use for its production processes.

"SMS group offers its own platform that gives customers the option of using the Data Factory to analyze their existing process models and determine how they can optimize their production."

The two men agree that companies should see digitalization and the underlying connectivity as an opportunity. "Companies that don't utilize the opportunities of digitalization now won't survive," says Geerkens, and Steenken adds: "It's no good ignoring megatrends. They indicate to all of us – including the metal industry – where we are headed in the future."



THE REVOLUTION IN CONVENTIONAL SERVICE PRODUCTS

Connectivity is also a major topic in the Technical Service Division. One example is remote support using augmented reality. It enables our service experts to assess situations and provide support without having to be on-site. Digitalization is revolutionizing conventional service products. SMS group's Technical Service created its first digital products years ago. Today, they provide a good springboard into the digital age.

"We will utilize the possibilities of the Learning Steel Mill for our service business as well."

Jochen Burg, Vice President, Technical Service

DIGITAL HELPERS FOR HIGHER QUALITY

When extensive know-how comes together with sophisticated technical expertise, the result is powerful technology for the metal industry. The best example of this is the Product Quality Analyzer, or PQA®. It is a combination of the comprehensive process knowledge of MET/Con and the Quality Execution System QES from QuinLogic. This system monitors, documents, and ensures process and product quality.

The QES solution logs and brings together the quality data from various process stages. Furthermore, a rule-based certification module checks in all process stages the extent of compliance with the quality standards specified by the customer. The Quality Execution System utilizes central servers and analyzes online data.

PQA® was developed over five years by MET/Con. Customers use it as a valuable decision-making aid that delivers clear recommendations for action in production along the entire process chain. What makes it so convincing is that it logs relevant production and process data, then gives clear instructions for action in the event of quality deviations so that threatened defects can be avoided.

The PQA® rulebook is based on experience and expertise. It's a special advantage that knowledge is transferred online and tailored to the specific application – in the form of quality rules and production know-how. Furthermore, knowledge does not get lost, which is often the case when expertise is passed on to customers in writing or verbally.

LEARNING IN NEW DIMENSIONS

Groundbreaking teaching techniques and methods have become established in the SMS TECademy Mönchengladbach since December 2018. That's because the newly opened training room is equipped with the very latest training technologies. This digital classroom offers customers a unique, interactive way of learning. The advantages: trainings using the virtual model do not disrupt the real plant production plan and can take place at any time. Furthermore, participants can work without the risk of mistakes and damage, and they learn more effectively.

PQA® IN PRACTICE

The Product Quality Analyzer is already being used around the world by renowned steel producers such as Big River Steel, Shandong Iron & Steel Group Rizhao (SDIS), or Swiss Steel. Magnitogorsk Iron & Steel Works (MMK) of Russia is also set to use the PQA® quality management system in the future.

At Chinese company SDIS, the quality management system is integrated in the production complex for flat steel. This means that, even before production deviations can occur, machine operators can take action to avoid them. Prior to commissioning, a virtual production operation gives operators the opportunity to learn the functions of the plant and how to use it. With all these components, the SDIS plant is one of the world's most modern production facilities for flat steel.

PROCESS OPTIMIZATION AND PLANNING

EFFECTIVE CALCULATION SYSTEM

After attracting the contract from a customer in Canada, we upgraded the complete steelmaking plant with a new process optimization and planning system based on our X-Pact® Process Guidance.

Our system starts when the pig iron is transferred at the blast furnace with GPS monitoring of the torpedo ladles. For every melt, the system dynamically calculates the cost and availability of the added materials for the BOF steel plant such as scrap, lime, and other materials.

The production planning covers the entire steel plant, consisting of 6 primary and secondary metallurgy units (2 BOF, 2 LF, 2 CAS-OB, scrapyard), right up to transfer to the two continuous casting plants.

“With SMS group, we have found the right partner for the modernization of our plant.”

Hossam Fahmy, Plant Director, EZDK

MORE SUCCESS WITH MODERNIZED PLANTS

Meeting new requirements with outdated plants is not easy. So it’s no wonder that revamp projects are playing an ever greater role. A comparison of figures makes it clear what modernization of an old plant can achieve.

An impressive example is the Al Ezz Dekheila Steel Company (EZDK). Twelve months after SMS group replaced the complete outdated automation and drive systems, the results posted by the company in Alexandria, Egypt tell a clear story.

Production is running at record level, with a new annual capacity of one million tons of flat steel. Furthermore, product quality has improved significantly.

That is due, above all, to the advanced technological components: The MMSplus mold monitoring system supplies information about what is happening inside the mold, while the integrated early detection system reduces costly production stoppages and repair costs to a minimum.

DSC (Dynamic Solidification Control) technology makes optimized cooling strategies possible. Finally, new control desks and HMI systems ensure easier plant operation.

INDUSTRY 4.0

UNIFORM DATA AND USEFUL TOOLS

SMS group is making more and more customers fit for Industry 4.0. The key to this is implementing uniform electrical and automation systems. Most recently, SMS group equipped the Saudi Iron and Steel Company (Hadeed) in Saudi Arabia with state-of-the-art automation technology.

Its core feature is the elimination of different data sources, and instead working with a “single source of truth.” Intelligent analysis tools ensure efficient use of the already existing data. A virtualization platform makes working even easier. Also useful is modern web reporting, which maps in detail plant production and material consumption data.

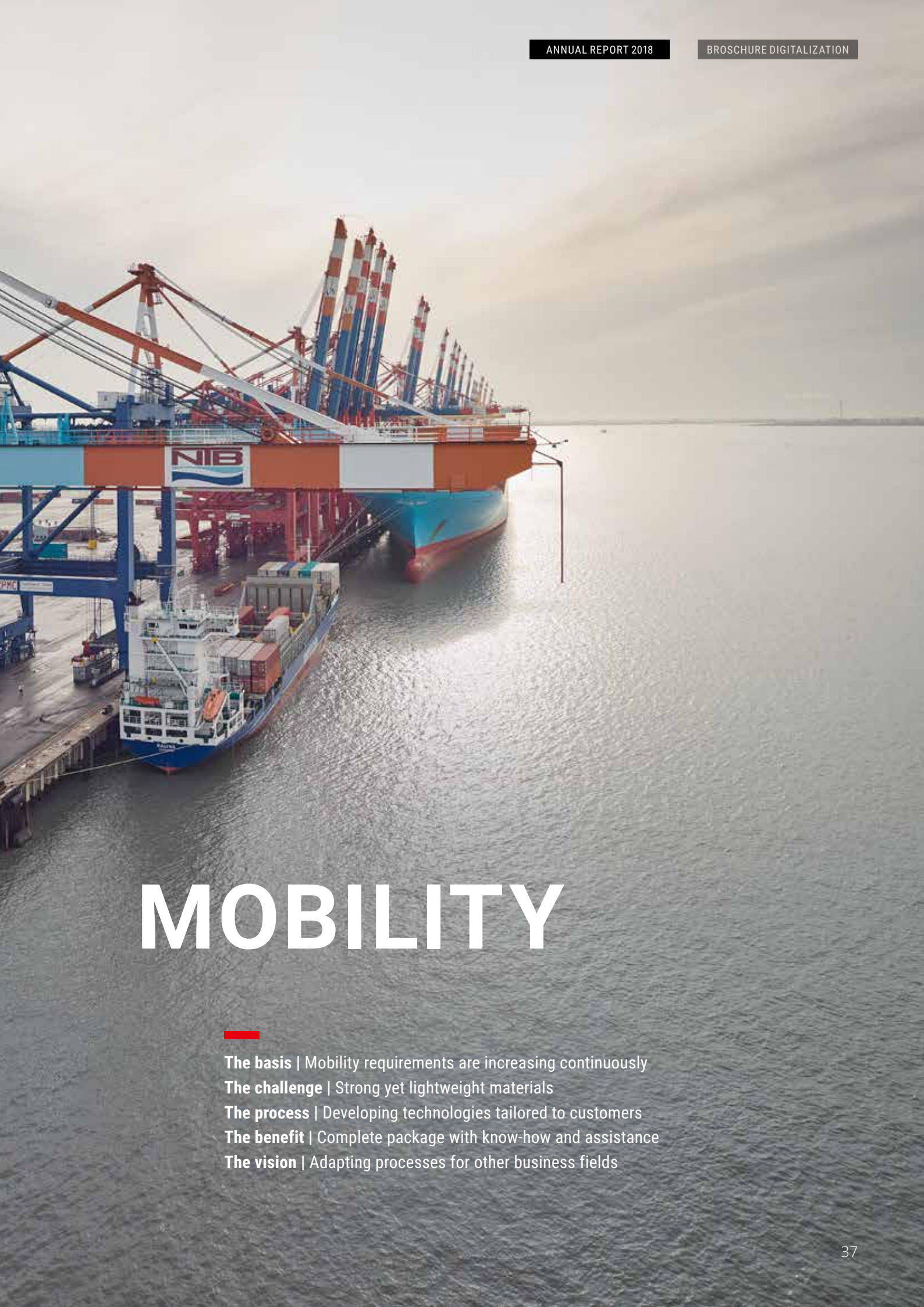
Hadeed is a good example of the current state of development of many steelworks. Typical for the industry are heterogeneous system landscapes with different data sources. Implementing uniform systems can unlock vast savings potentials in steelmaking and continuous casting plants. Even as costs decrease, product quality increases.

SMS group is the ideal partner here because excellent process understanding plus extensive experience with IT solutions comprise a dual qualification.

“We estimate that modernized electrical and automation systems can save five to ten percent of the costs of steelmaking plants per year.”

Michael Bruns, Sales, SMS group


ZPMC
MAERSK



MOBILITY

The basis | Mobility requirements are increasing continuously
The challenge | Strong yet lightweight materials
The process | Developing technologies tailored to customers
The benefit | Complete package with know-how and assistance
The vision | Adapting processes for other business fields

"IT'S PART OF OUR SERVICE-ORIENTED APPROACH THAT WE KNOW AND UNDERSTAND BOTH THE MARKET AND OUR CUSTOMERS' PRODUCTS."

Mobility opens up possibilities – on all kinds of levels. Today, we are a society of globetrotters. By air, water, road, and rail, we travel to faraway countries on journeys of discovery. Tourism figures show that air travel is continually increasing, and freeways are packed with traffic. Materials and goods are transported across ever larger distances in ever shorter time periods. For example, over the oceans in containers.

Naturally, today's mobility requirements also affect the steel industry: "The properties materials for mobility applications must meet are high strength, good formability, and good coating capability," explains Dr.-Ing. Holger Behrens, Vice President, Processing Lines and Furnace Technology. To improve crash safety and passenger protection, the automotive industry demands modern materials such as high-strength steel and aluminum alloys. SMS group offers the right solutions.

"A sequence of several process technologies in a strip processing plant ensures surfaces with the required function and materials with the necessary strength."

Another major driver of development is e-mobility. Currently, the production of electrical sheet for electric automobile motors is challenging the lim-

Dr.-Ing. Holger Behrens, Vice President, Processing Lines and Furnace Technology

EXTRACTIVE METALLURGY

We are creating opportunities to expand into new business fields by adapting acid and alkali process stages in steel and aluminum treatment for use in new areas of the raw materials industry. Especially technologies for extracting lithium, vanadium, or cobalt as well as the production of high-purity aluminum oxide offer new opportunities.

its of process technology. Demand here is growing steadily. Furthermore, lightweight construction and efficiency are key aspects for e-mobility.

"The electrical sheet used in motors must have the necessary magnetic properties to minimize energy losses and increase efficiency. At the same time, the chassis must be weight-optimized, high strength, and formable so that it can absorb energy in the event of an accident," adds Behrens.

There is a debate on the market about whether aluminum is the better choice for lightweight construction. Behrens explains that SMS group is also tackling the subject of lightweight construction in response to market pressure.

"In the automobile industry, vehicles come with ever more electrically powered features. As a result, batteries are getting heavier. So we need to save weight elsewhere – with even more sophisticated vehicle structures."

When asked the "steel or aluminum" question, Behrens is diplomatic. A lot of aluminum is used in people transport and mobility because it's about three times lighter than steel. Whether in planes, trains, or cable cars. Similar to steel, aluminum sheet undergoes treatment and surface processes that give it the desired properties.

Yet steel also comes with benefits, namely high strength. For the same effect, aluminum components in cars need to be thicker. "Steel continues to be important because it can be produced in relatively thin sheet with very high strength." →

"WHEN WE IDENTIFY AN INCREASED DEMAND, WE ALSO WORK ON COMPLETELY NEW PROCESSES."

Dr.-Ing. Thomas Winterfeldt, Vice President, Forging Plants

Focus on global market development

Customer requirements are growing, essentially in three areas: productivity with simultaneous reduction in energy input, plus quality and process reliability. In response, we continuously optimize our plants and machinery to achieve these objectives.

Every year, we invest high sums in product development and technology, take part in public projects, and maintain close contacts with universities.

Through intensive global exchanges with our customers, participation in trade shows and conferences, as well as our branches worldwide, we have an excellent overview of market development.

When we identify an increased demand, such as currently in the use of high-strength aluminum, we optimize our technologies in this area and also work on completely new processes.

This is how Behrens explains what SMS group has to do to meet mobility requirements: "We need to develop and build new technology solutions that produce primary materials for ever stronger and lighter components, but also provide special material properties or surface functions. It's about various materials such as steel, stainless steel, electrical sheet, and aluminum."

"We are more than a supplier of technical equipment. SMS group is a technology supplier with high process expertise. This makes us the ideal partner to engineer and build plants as well as to plan upgrades for our customers."

When a customer wants to manufacture a specific product such as automotive sheet or facade cladding, the question is: What properties must the product have? "First we need to understand what properties e.g. automotive manufacturers will expect in the future from sheet for chassis production, or what functional surfaces they want for components. Then we will know what process

stages we have to develop or apply to give our customers the necessary capabilities to produce these products."

Behrens sees the key in a complete package consisting of technological expertise and the capability to develop new process stages to market maturity.

"We supply not only technological competence, but also the appropriate project management. Furthermore, we support our customers in planning and financing their project."

Increasing demands on materials and production plants
The demands on flat-rolled steel and aluminum products are continually increasing. What drives this is the global transformation process taking place in the automotive industry as a key industry, but also other areas such as infrastructure, energy, transport, and safety.

Customers expect ever higher quality in terms of geometric tolerances, surfaces, and metallurgical properties. This promotes the development of new and better materials such as multi-phase steels with a very good combination of strength and ductility for safety-relevant components in vehicle construction. Our plant technology includes

"THE WORLDWIDE TRANSFORMATION PROCESS IN THE AUTOMOTIVE INDUSTRY IS AN IMPORTANT DRIVER OF CHANGE."

high-performance mechatronic systems with intelligent automation and process solutions. That means we deliver the production plants necessary to manufacture and further improve all common metal materials.

We are continuously further developing our technologies to meet our customers' requirements. For example, downstream heat treatment in our newly developed MFQ (MultiFlex-Quench®) system produces top-strength heavy plate.

We draw on more than 30 years of experience in mathematical and physical plant and process simulation to optimize plant layout and development. This is how, in close dialog with our customers, we tailor new construction or revamp projects to their specific requirements based on the production programs and output they want. Our plants come with a high degree of automation and, increasingly, digitalization. That ensures maximum plant availability and top product quality.

Stephan Krämer, Vice President, Flat Rolling Plants

It's crucial here that we respond to global market trends such as the substitution of conventional combustion engines with greener solutions.

ELECTRICAL STRIP PRODUCTION

PROFITING FROM GROWING MOBILITY

Sales figures for electric vehicles are growing steadily. This shows clearly that sustainability considerations are impacting on mobility. E-mobility is now a long-established trend.

To meet increasing demand, electrical strip, also known as silicon steel, is taking on a key role. This material is crucial for creating the electric drive systems, but also the necessary infrastructure with a dense network of charging stations. Due to its good electromagnetic properties, electrical strip is a core material for efficient motors, generators, and transformers.

This is where SMS group comes in. We offer technologies that enable conventionally integrated steelmaking plants to produce high-quality silicon steel.

The production of this material for electric vehicles and charging stations in turn requires hot strip with specific properties. Included here are a defined silicon content and the right strip dimensions.

There is a strong demand for high-quality material because the electric motors and generators determine the performance of a vehicle, machine, or other electrical system.

Automobile manufacturers are looking for highly effective materials to improve the performance of their vehicles. SMS group has the expertise to deliver, and in cooperation with MET/Con, we offer extensive process support for electrical strip production. This is about not just metallurgical aspects and layout planning, but also commissioning and smooth operation.

Here is a successful example: Within a short time and with the help of MET/Con experts, Anshan Steel in China was able to produce high-permeability electrical strip using its existing plants.

ALUMINUM FOR THE CARS OF THE FUTURE

Producing aluminum for the European car industry – this is one of the main business fields of the Thöni Group headquartered in Tyrol, Austria. For the company's new plant in Pfaffenhofen, SMS group is installing an extrusion press line for aluminum.

This is the fifth SMS extrusion press installed at Thöni. A special challenge here is the adjustment of the cooling process to the specific product. This guarantees that the plant reproduces identical material properties in subsequent orders, which is absolutely essential for the automotive industry. With this project, Thöni is investing in the very latest extrusion press technologies.

GROUNDBREAKING COMPONENTS

- Eco-Draulic concept for reduced energy consumption
- Modular process control
- MIDIS technology package for administration of all product-relevant data
- IBA measurement and analysis system for remote troubleshooting
- High-precision linear guides for all main moving parts

UPGRADED FOR THE AUTOMOTIVE INDUSTRY

A project conducted in close cooperation between SMS group and Hyundai Steel in Pohang will ensure the Chinese company's flexibility and ability to respond to market demands. Hyundai Steel is modernizing its existing bar steel mill with a five-stand PSM® (3-roll precision block). What's special here is the hydraulic roll adjustment under load. This function is controlled by the TCS performance module, which is a core element of the plant. Furthermore, the stands move fully automatically.

The upgrade will take just a short time and will make the Pohang facility efficient and profitable. It supplies a broad range of products to the automotive industry. Each PSM® is completely manufactured and assembled in the SMS group workshop in Mönchengladbach. This also facilitates the revamp work at Hyundai Steel.

“With the extrusion press line from SMS group, we are creating the basis we need to meet the growing demand for aluminum components.”

Helmut Thöni, CEO and shareholder, Thöni Group

EMG SOLID® SUCCESSFULLY ESTABLISHED

ON-STRIP MEASUREMENT SIMPLIFIES PROCESSES

The EMG SOLID® oil film measurement system was launched in 2016. Initially based on infrared spectroscopy (EMG SOLID® IR), it is now supplemented by an alternative system based on laser-induced fluorescence spectroscopy (EMG SOLID® LIF). Today, this system family forms the basis for reliable measurement of the oil film on steel and aluminum strip. Currently, there are almost 30 systems in production operation, which reflects customer trust in EMG solutions. Applications beyond conventional on-strip measurement are now possible with EMG SOLID®. They include, for example, oil film measurement on individual plates during the pressing process.

“Innovative, quality-securing systems are the focus of our user-centered development.”

Harald Rackel, CEO, elexis AG

TOP SPEED THANKS TO SILICON

Less weight pays off. This golden rule applies especially when it comes to mobility. That’s why materials for means of transport must be as light as possible.

Aluminum alloys are a good example, because they offer the strength of steel at just one third of the weight. Silicon plays a key role here. It is the main alloying element in the production of aluminum alloys. This is also true at Press Metal Berhad (PMB), South-East Asia’s leading aluminum producer.

The Malaysian company contracted SMS group to supply two electric submerged-arc furnaces for silicon. The planned production capacity is 32,000 tons of silicon per year. A special feature of the plant is the rotating furnace vessels. The project means that PMB can produce its own silicon. The company’s aluminum alloys are used, for example, in high-speed trains such as the Shinkansen in Japan.

THE NEW STEEL GENERATION

SMS group and its consulting subsidiary MET/Con have raised the bar for steel properties. They have developed a steel named TRIP600-TH for an Asian steel producer. It combines the high strength of a TRIP steel (transformation-induced plasticity) with the elongation values of an IF steel (interstitial-free) and stands out for exceptionally high quality.

What made the new steel possible was the innovative cooling strategy developed by SMS group. Thanks to its special properties that ensure tensile strength, elongation, and forming without edge cracks, this steel stands for a new generation of AHSS (advanced high-strength steels) termed a “3rd generation steel grade.”

Furthermore, the material saves resources. Due to quasi-isotropy, plates can be cut from the strip irrespective of the rolling direction. This minimizes waste. The new steel grade is used in the automotive industry, where the Asian steel producer has its customers. It is ideal for the vehicles of the future, which will be designed to suit the infrastructure of large cities.

SUSTAINABILITY

The challenge | Ever stricter legal requirements
The process | Developing solutions with customers
The advantage | Solutions for electronic scrap recycling
The vision | CO_2-free production of metals

"WITH OUR PLANTS, CUSTOMERS CAN PRODUCE SUSTAINABLY AND RESPONSIBLY."

Sustainability has become a hot topic. During the economic miracle of the 50s and 60s, people did not think much about pollution or the finite nature of resources. However, by the end of the 60s, the consequences of this attitude were evident.

Ever since then, environmental protection and combating climate change have been major objectives that influence what we do as individuals, but also as businesses. The energy transition, e-mobility, organic foods – our daily habits are changing. Species protection and cleaning up the oceans are becoming increasingly important issues.

More and more companies have adopted the principle of resource-efficient and sustainable operations. That is because one thing is clear: Only sustainable companies are competitive in the long term.

In many projects, SMS group is confronted with sustainability aspects that cover the entire range of eco-technologies. Everything from cutting energy consumption, through the utilization of byproducts (e.g., gas), up to avoiding emissions such as fine dust. Dr. Christian Fröhling, Vice President, Metallurgical Plants and Environmental Technology, knows all about the challenges:

"There are statutory requirements that can be completely different in different countries or even regions. For each customer, we develop and build solutions that go even beyond these – sometimes very strict – requirements."

At first glance, investments in eco-technology often do not offer an economic added value, as in the case of installing a filter system for example. That is why legal requirements play a decisive role. →

Dr.-Ing. Christian Fröhling, Vice President, Metallurgical Plants and Environmental Technology

FUTURE TOPICS:

- Electronic scrap recycling
- Add-on products such as gas recovery plants
- Hydrogen route as an alternative to the conventional blast furnace route
- Digitalized production

"In cases like this, we also point out to customers what the benefits of these investments are – i.e., cutting operating costs."

Modernizations are also a major factor for sustainability. "SMS group offers both small 'tuning kits' as well as full-scale core upgrades. However, such major revamps can be very costly. When it comes to new plants, things are easier because the whole facility is designed from scratch. For modernizations, we have to adapt to the existing situation. That comes with more risk because you don't know in advance what might be hidden," explains Fröhling. Yet every modernization also offers the opportunity not only to improve consumption values by, e.g., optimizing pump or fan power, but also to significantly increase production efficiency.

Steel already ticks a lot of boxes as a sustainable material. After use, it is melted down and reused – making it an excellent recycling material. Today, steel is already the world's number-one recycled material. The situation looks different for e-waste. This burgeoning market is of central importance for SMS group, also in terms of preventing incorrect disposal.

"We offer a process named UrbanGold for recycling electronic scrap. It extracts valuable, high-purity metals such as gold, platinum, palladium, copper, and nickel from electronic scrap at a rate of almost 100 percent. The plant design is also extremely attractive economically," says Fröhling. He is convinced of the importance of this kind of process.

At SMS group, sustainability is directly linked with the megatrend of connectivity. Fröhling explains: "Data is also collected to optimize sustainability processes such as gas recovery and filter technologies and to reduce overall energy consumption in the steel mill." Intelligent data analysis can optimize charge materials in a smelting furnace or adjust temperature controls so that less furnace power is needed.

"I believe sustainability processes are an integral and relevant part of the increasingly important digitalization trend."

Another central aspect is reducing CO_2 emissions in steel production. Fröhling explains: "More and more customers want us to supply solutions for steel production with a massively reduced carbon footprint."

SMS group has defined CO_2-free steel production as a strategic development area. The company is expending considerable resources so it can offer its customers solutions that will reduce specific emissions per ton of steel down to 0. "We are conscious that our plants have an enormous influence on global steel production and that we have a responsibility to promote sustainability in this area," says Fröhling. This shows once again that SMS group keeps an eye on the big picture.

Sustainability is not a new topic at SMS. For decades, the company has been cooperating with customers to research and develop innovations for more energy efficiency. This is exemplified by the Ecoplants label, which is awarded by an internal committee to plants that reduce emissions, increase the recycling quota, or cut energy consumption. Here is how Fröhling sums up the focus in this area:

"Our top priority is that our customers benefit both ecologically and economically."

SERVICES FOR SUSTAINABLE PLANTS

SMS group Technical Service has a clear goal: maintaining the value of existing plants. When it comes to spare parts, tailor-made maintenance, or special training offers for customer personnel, our customers benefit from high-performance service packages, which are available at 50 locations worldwide. SMS group is a lifelong partner for the entire metallurgical process chain.

“SMS group is the only plant constructor in metallurgy that covers the entire process chain. Our successful service is especially important in repair and modernization projects.”

Johannes Kahlen, Vice President, Technical Service

Dr.-Ing. Thomas Hansmann, Managing Director, Paul Wurth Italia

New paths to green steelmaking
Paul Wurth group develops the right solutions and technologies to ensure cost-effective and simultaneously eco-friendly operation of our plants.

This involves three core objectives: increasing plant efficiency through process optimization, recycling byproducts such as sludges and dusts, and minimizing CO_2 emissions into the atmosphere. Key here is using nonfossil reduction agents.

"The production of CO_2-free steel would send an incredibly strong signal to the steel industry."

The megatrend sustainability demands change, and that's why German steel producers want to eliminate carbon by 2050. The only alternative in sight today is the hydrogen route. Instead of coke, hydrogen is used as the reducing agent.

The technology is based on hydrogen production by electrolysis. Electricity is used to separate hydrogen into its two components oxygen and water. Because electricity replaces carbon as the energy source, the hydrogen route is very energy-intensive.

Therefore, steel producers must decide whether they want to produce cheaply or with low emissions. Changing to low-emission production certainly has advantages: Supplying steel produced CO_2-free would send a strong signal to the steel industry.

The task now is to develop and provide the corresponding technology. What is necessary here are electrolyzers to generate hydrogen, electric-arc furnaces to produce the steel, and direct reduction plants that operate with pure hydrogen.

With the investment from Paul Wurth S.A., Sunfire GmbH will from 2019 implement commercial multimegawatt major projects using high-temperature electrolysis and power-to-liquid technology. For Paul Wurth, partnering with the technology leader in high-temperature electrolysis represents an important step toward technology innovations that will lead to green steelmaking. It also opens up the opportunity to enter the growing market for e-fuels.

Incidentally, the latest high-temperature electrolysis product can reactivate not only water, but also CO_2. This means the exhaust gas from combustion can be converted directly into a clean raw material that can replace oil or natural gas.

Paul Wurth aims to play a leading role in the upcoming transformation of the steel industry toward CO_2-free steel production. Supporting customers in their changeover to hydrogen-based pig iron production will help them meet their climate protection goals.

“We want to play a leading role in carbon-free steelmaking.”

Georges Rassel, CEO, Paul Wurth

“With the modernization of our gas purification plant, we are ideally equipped for the ecological challenges of the future.”

Cesar Alejandro Parisi, Head of Hot Rolling Mill and Steel Plant Construction, Ternium Argentina

MORE CAPACITY FOR RECYCLING

To expand its smelting capacity, Spanish company Aludium Amorebieta ordered a multi-chamber smelting furnace for clean and contaminated scrap from Hertwich Engineering, a member of SMS group.

The move is a reaction to the growing share of recovered material that must be effectively and profitably processed. The furnace is suitable for the most highly contaminated scrap. Due to its advanced design, it can cut gas consumption to 300 kWh/ton. That reduces not only operating costs, but also emissions. It enables eco-friendly furnace operation.

The rolling mill in Amorebieta was commissioned in 1961 for the production of rolled aluminum products, and since then it has been continually extended and modernized.

The strategic focus is on building and construction, distribution, and specialties.

MORE EFFICIENCY WITH INTELLIGENT GREEN TECHNOLOGY

Just how important plant modernization is for their eco-balance is shown by these two examples: SMS group upgraded the gas purification systems of the Argentine company Ternium Argentina, and of Uddeholm AB in Sweden.

The project in Sweden comprised two phases. The first step was installing an efficient filter system and replacing the roof canopy with an SMS Frustum fume evacuation hood. The new hood ensures exhaust gases are much more effectively captured and evacuated. Phase 2 consisted of substituting the primary fume line for direct extraction of the hot gases. As a result, the exhaust gas volume can be increased to 66 percent without increasing energy consumption. The dust content at the chimney outlet is 50 percent lower than the volume required by regulations. Furthermore, now no hazardous substances are generated during scrap drying.

The new BOF gas purification plant at Ternium Argentina provides increased purification efficiency coupled with significantly lower emissions. The plant, dating from the 1970s, was upgraded to today’s state of technology.

NEW DIMENSIONS IN STEEL PRODUCTION

You can follow change – or drive it yourself. SMS group has chosen the second approach in the field of bar steel production. The PMH solution developed by SMS is a successful option for processing large-format forged steel bars up to 600 mm in diameter. This is the first cost-effective peeling method, and it is replacing conventional turning technology.

The advantages: The process is up to 16 times faster, and also copes with minor curvatures in the forged bars. SMS group developed this peeling machine together with BGH Edelstahlwerke GmbH and CERATIZIT within a period of two years. It represents a whole new dimension, because this kind of machine was previously not available for such large formats. The process also improves operating costs. It can significantly reduce maintenance and tool-changing costs. The new system has expanded BGH’s production range. The steels from the Siegen-based company are used, for instance, in sustainable wind energy or electric heat generation as well as in environmental technology. Examples of products made with BGH primary materials are high-load gear units for wind turbines.

PROBLEM-FREE COMPLIANCE WITH TOUGH ENVIRONMENTAL REQUIREMENTS

North American Stainless (NAS) has taken a leap forward. SMS group supplied a 20-roll cold rolling mill and a stainless steel bright annealing line to the company based in Kentucky. This gives NAS the USA's most powerful plant for the production of cold-rolled and bright-annealed steel strip. When placing this order, the company also took account of sustainability. For instance, the regenerative Supafine filter system ensures eco-friendly cleaning and efficient cooling of the rolling oil. The fume extraction system also supports green operation. It also complies with the strict local environment protection laws. The technological highlight is the Drever furnace. Thanks to its high effectiveness, it uses 60 percent less energy than a conventional design with muffle furnace. Not only efficient, the plants are also flexible and ensure high product quality.

THREE EXAMPLES OF RESOURCE-SAVING PRODUCTION:

1. Color coating line for our customer Henan Zhongfu in China. The solvent-laden exhaust gases are used as heat energy. Once the process has started, the furnaces can be operated without any additional energy input.
2. Recycling/melting aluminum scrap. Ecomelt furnaces burn away contamination in scrap. The energy released can then be recovered and used.
3. Clean induction furnace technology in aluminum extrusion press plants. Combined with gas-heated furnaces, this ensures precision process control for bolt preheating.

ENERGY EFFICIENCY COMBINED WITH HIGH QUALITY

Steel producers all face the same challenge: they must produce to higher quality standards as energy-efficiently as possible. SMS group supplies the solution. X-Pact® Leading Automation offers not only innovative process and operator guidance, but also improved energy efficiency. The smart software solutions ensure significant savings of electricity or fossil fuels.

For example, X-Pact® Gas Cleaning Control provides efficient control of the gas purification unit. That boosts efficiency and enables additional gas recovery. Whatever the application, SMS solutions take account of energy costs, plant utilization, productivity, and material costs. Fully automated operation optimizes production and prevents malfunctions.

EFFICIENT UTILIZATION OF WASTE GASES

THE PATH TO CO_2-FREE IRON ORE REDUCTION

When it comes to reducing CO_2 emissions, the iron and steel industry also has a responsibility to improve its production processes. Usually, steelworks owners and operators have to take drastic action to reduce their CO_2 emissions to the required level. To do this, they need practical solutions.

That is where Paul Wurth comes in. The SMS group subsidiary develops a wide range of technologies that reduce the CO_2 emissions of the conventional blast furnace route in stages.

The constant objective is the efficient utilization of exhaust gases from the steel production process. For example, the metallurgical utilization of blast furnace gases can significantly reduce the CO_2 emissions of steel plants. Another aim is to use electricity from renewable sources. Overall, the installation of new technologies and retrofitting new systems into existing plants are the best ways of achieving a lower CO_2 footprint.

Paul Wurth always draws up plant-specific strategies, because each steelworks comes with a different distribution and utilization of exhaust gases.

INN

CREATIVITY

PEOPLE

The people in SMS group are the foundation on which our success is built. Because we are aware of this, we integrate our employees into our Task Force measures, offer future-oriented wage agreements, and recruit new talents from around the world to complete our teams.

OVATION

DIVERSITY

MOTIVATION

ATTRACTING YOUNG TALENTS TO SMS GROUP

SMS group puts a great deal of effort into winning over suitable candidates, and adopts the latest recruitment methods. For example, SMS group took part in devcom in Cologne in August. For the first time, this job forum was held ahead of gamescom – the world's largest trade show for electronic entertainment. The show is dedicated to games development and networking. SMS employees from Human Resources, the Electrical and Automation Systems Division, and SMS digital were on the scene for two days.

Then, on November 7 and 8, SMS was present at another event in Cologne. At DIGITAL 2018, experts from the industry presented insights into the latest developments in digitalization. There was also a focus on strategic ways to achieve intelligent data connectivity. Our SMS group stand personnel talked to some interesting talents.

Creativity was also at the center of the 3rd Siegen Recruiting Slam on November 13 – an event organized by the Chamber of Commerce and Siegen University. Here, HR managers battled to attract qualified recruits in seven-minute pitches under poetry-slam rules. Peter Langer, Head of HR at SMS group, took inspiration from James Bond. He described young talents as "agents 4.0" on a mission named "digitalization." →

A SYMBOL OF CONNECTION

The town of Hilchenbach and SMS group jointly developed the idea for this piece of art in a public space. Apprentices helped design the sculpture.

Once the sketch was converted into a CAD drawing, the concrete implementation could begin. The artwork combines various elements: Rolls that represent SMS group rolling mills seem to roll the wavy sheet metal into shiny stainless steel strip.

The sculpture is embedded in blue glass fragments and brownish stones that symbolize the local river and the region's iron ore reserves. The Hilchenbach logo is also integrated. The artwork symbolizes the close connection between Hilchenbach, the Siegerland region, and SMS group.

A taste of what young talents can learn at SMS group comes from a project that combines plant and machinery construction with art. 20 apprentices from all training types at SMS group – trade, commercial, and technical – created a sculpture for a roundabout in Hilchenbach. The sculpture consists almost exclusively of left-over materials from production.

The most important factor in the project was teamwork, because a wide range of different skills was necessary. The idea behind the artwork is that it will get especially young people interested in professions in plant and machinery construction, because it impressively demonstrates how varied the job of plant mechanic is.

A PROGRAM FOR TOMORROW'S MANAGERS

The average age of managers is increasing. This raises the question of who will succeed them in a few years' time. With "Leaders of tomorrow," SMS group developed a concept for succession planning and launched it in November 2018. 18 employees in their mid-30s to mid-40s were selected according to criteria such as flexibility, product knowledge, and leadership quality. They undergo various modules, work on a themed project, and train in specialist online seminars. The program is being repeated in 2019 with new participants and a similar procedure.

PRIZEWINNING INITIATIVES

With the corporate principle "Respect Instead of Discrimination," SMS group sets a clear signal. It all started in 2013 when a notice went up bearing the statement "Respect! No room for racism" in the Hilchenbach LernWERK. It was a visible sign that fairness among colleagues is a top priority in the workshop.

Ultimately, this led to the development of a seminar concept initiated by the Hilchenbach works council. In the seminars, employees learn to eliminate discrimination. Today, the seminar is even part of the apprenticeship program in Düsseldorf, Hilchenbach, and Mönchengladbach. "Our goal is to raise employees' awareness and encourage more tolerance in our company," says SMS CEO Torsten Heising.

This commitment has gained wider recognition. In November, "Working and Living in North-Rhine Westphalia," an educational program carried out by the Association of German Labor Unions in cooperation with adult education centers, awarded the Hilchenbach Works Council first prize in the category "Democracy at Work." The jury was especially impressed with the seminar concept. The educational organization awards the biannual prize for special achievements in promoting democracy in the workplace.

There was another special honor for SMS in October 2018 when SMS group GmbH received the *"Gütesiegel Ausbildung Südwestfalen"* (Quality Award for Training in South Westphalia). With this award, Siegen Chamber of Commerce confirmed the exemplary quality of the company's apprenticeship program. This is one way the Chamber of Commerce supports the implementation of new qualification courses to create more attractive options, especially for talented applicants.

TRANSFORMATION FOR THE FUTURE

SMS group looks to the future not only when it comes to megatrends, but also with Task Force '21. The transformation program is essential to ensure the company retains and expands its position as a global leader and leading partner. This is because of the new requirements that result from the changing market and substantial overcapacities in the steel industry.

Today's focus is less on new plants and more on revamps. Furthermore, projects are becoming smaller and more complex, while price pressure is increasing. That means cost-effective work must combine with high performance and discipline in project processing.

This is the strategy behind the program: Task Force '21 deals with 10 Central Projects and eight Business Units.

There is a total of over 1,000 individual projects in Germany and abroad. Each of the 10 Central Projects is managed by a CP manager, and further managers are responsible for ensuring the individual measures are carried out and completed successfully. Responsible for each Business Unit is a Project Officer / Owner and Transition Officer. Everything comes together in the Project Management Office, which acts as an extension of the Managing Board. It not only ensures all measures are implemented, but also performs a neutral evaluation of the results.

Task Force '21 is designed to strengthen the core business of SMS group, cut costs, and harmonize processes worldwide. This will in turn boost profitability and competitiveness.

WE TAKE EMPLOYEES' IDEAS SERIOUSLY

The Task Force '21 package also takes account of the results of the global employee survey conducted at the end of 2017. More than 70 percent of the 12,000 people addressed answered the questions and submitted written assessments.

The analysis revealed that employees rate above all the willingness to work and performance capability in their areas highly. Most of them find it easy to contribute their skills and apply knowledge from other areas of the company to their own work.

FAR-SIGHTED COLLECTIVE BARGAINING AGREEMENTS

After several months of negotiation between the pay committee and SMS group GmbH, the new future pay agreement was sealed in September. Essentially, the special pay agreement determines that there will be no wage increases up to the end of 2020, plus two hours of additional work without extra pay. In return, it rules out forced redundancies up to the end of 2023.

THE TEN CENTRAL PROJECTS:

- Forward Strategy
- Working Capital Management
- Sites
- Personnel Costs & Overheads
- Regionalization of Sales
- New Horizon
- Purchasing / Material Costs
- Sales Management
- Modularization/Standardization
- Processes & Systems

When work safety and environmental protection go hand in hand

ACTIVELY SUPPORTING WORK SAFETY

SMS group applies a wide range of equipment and actions to protect our employees' health, both at the company's own locations and at deployment sites worldwide. This improves conditions, processes, and regulations relevant to occupational safety and the environment.

It shows how the company responds to today's heightened awareness of HSE (health, safety, environment), which also drives higher customer expectations.

Activities here include regular recording and evaluation of hazards and environmental aspects, reporting of results, a continuous improvement process, and the responsibility of managers on all levels to tackle the relevant topics.
Possible risks for the company and employees must be identified at an early stage and continually reduced.
Health, safety, and environmental aspects are always included in all decision processes.
As leadership behavior is key to a sustained positive development of accident figures, managers on the first reporting level of SMS group receive appropriate training.
At the 3rd and 4th International HSE Conference in April and November, corporate guidelines on HSE precautions will be drawn up to improve international cooperation of the companies in this area.
The International Day for Health and Safety at Work gives employees the opportunity to take part in activities relating to health and safety aspects.
The established HSE steering committees will continue their work at the two large German locations.
The Ecoplants label ensures that sustainability as well as ecological and economic goals are balanced, both in new plant solutions and in the further development of plant concepts.

FOCUS ON LOWER ENERGY CONSUMPTION

Sustainability and environmental protection are increasingly important for SMS group. That is why we operate our own energy management system in compliance with ISO 50001 for our factories and offices. Included here are these measures:

Auxiliary units and sealing air are switched off when the machines are switched off
Optimized lighting control
Room temperature adjustment
HDD are replaced by SSD storage media
Air heating is replaced by radiant heating
Central energy data logging of 350 energy meters at the Hilchenbach and Mönchengladbach locations

These measures were analyzed, developed, and implemented by an energy management team working in close cooperation with the various departments.

They have significantly cut energy consumption: In the years 2016 and 2017, the energy saving was 1,647,000 kWh, along with a CO_2 reduction totaling 858 tons.

ACCIDENT STATISTICS

The accident frequency in SMS group as a whole is 2.76 (2017: 2.76). Sick leave due to accidents amounted to 947 days (2017: 1,445), which was a reduction of 34 percent. The large German locations posted a slight reduction in accident frequency by 8.5 percent from 4.64 (2017) to 4.24 (2018). The absolute accident figure (work accidents) declined from 34 (2017) to 30 (2018). At 3.1 percent, the sickness rate was below the previous year's level (2017: 3.23 percent).

SMS group has been around for 148 years. Over this time, we have banked a collective expertise that enables us to supply turnkey solutions along the entire metallurgical process chain. As an innovation-driven company, we remain fascinated by new ideas and are not afraid of change.

For the latest information on our products and services, go to www sms-group.com or see our newsletter. You can find the SMS group newsletter app in the App Store and Google Play.

Simply download the SMS group app
here: http://www.sms-group.com/app

STRUCTURE OF SMS GROUP

DIVISIONS

PLANTS FOR IRONMAKING

COKE OVEN PLANTS

Coke oven plants
Coke oven batteries
Coke oven auxiliary plants
Coke oven automation and control
Coke oven handling machines
Environmental protection technologies for the metal industry
Steelmaking by-product recycling plants

BLAST FURNACE PLANTS

Blast furnace construction and modernization
Stockhouse and charging systems
Blast-furnace top charging systems
Blast furnace proper design
Blast furnace lining and cooling
Hot blast stoves and energy recovery
Blast furnace gas cleaning systems
Furnace automation and control systems
Coal grinding, drying, and pulverized coal injection plants
Tapping and measuring technology
Slag granulation
Pig casting machines

DIRECT REDUCTION TECHNOLOGY

MIDREX® direct reduction plants
Rotary hearth furnaces

METALLURGY AND ENVIRONMENTAL TECHNOLOGY

METALLURGICAL AND STEELMAKING TECHNOLOGY

Submerged-arc and electric smelting furnaces
Induction furnaces
Copper converters
Vacuum converters
CONARC®, converter and electric steelworks with the components BOF and AOD converters, electric-arc furnaces and S/EAF and SHARC for the production of carbon, stainless, and rustproof steels as well as special grades
PEM (Primary Energy Melters)
Pig iron pre-treatment, secondary and tertiary metallurgy
Auxiliary equipment

CONTINUOUS CASTERS

Billet, bloom, and beam blank production (rectangular, square, round, profile)
Medium, thick, and jumbo slabs
Thin and ultra-thin slabs, (CSP®/CSP® micro/ USP® continuous casters)
BCT® Belt Casting Technology plants

ENVIRONMENTAL TECHNOLOGY

Gas cleaning systems
Plants for energy recovery
Water treatment systems
Plants for waste material processing and recycling

FLAT ROLLING PLANTS

HOT ROLLING MILLS

Hot rolling mills
Steckel rolling mills
Heavy plate mills
CSP® technology/ USP® technology
Filter and environmental protection plants
Water supply systems
Logistics systems

COLD ROLLING MILLS

Tandem cold rolling mills
Reversing rolling mills
Skin-pass mills
Multi-roll mills
Filter and environmental protection plants
Logistics systems

ALUMINUM PLANTS

Hot strip rolling mills
Tandem cold rolling mills
Individual stands
Thin strip stands
Shear and slitting equipment
Filter and environmental protection plants
Logistics systems

PROCESSING LINES AND FURNACE TECHNOLOGY

STRIP PROCESSING LINES

- Pickling lines
- Hot-dip galvanizing lines
- Annealing lines
- Coating lines
- Annealing and pickling lines for stainless steel
- Processing lines for aluminum strip
- Processing lines for Si-electric strip
- Acid regeneration plants
- Hydrometallurgical plants

THERMAL PROCESS TECHNOLOGY

- Furnaces for heat treatment of steel and nonferrous metals
- Cooling plants for heat treatment of steel and nonferrous metals
- Drying furnaces for steel and nonferrous metals
- Furnaces in CSP®/USP® plants
- Reheating furnaces

LONG PRODUCTS

SECTION AND BILLET MILLS

- Heavy section mills
- Rail mills
- Blooming mills
- Billet mills
- Medium section mills

BAR AND WIRE ROD MILLS

- Wire rod mills
- Merchant bar mills
- Bar mills for quality and special steels
- Combined wire rod and bar mills
- Rebar mills
- VCC® lines
- Coil handling systems

BRIGHT STEEL PLANTS AND FINISHING LINES

- Drawing machines
- Peeling machines
- Straightening machines
- Grinding and polishing machines
- Thread cutting and chamfering machines
- Pipe end upsetting and sizing presses
- Hydrostatic pipe testers
- Finishing lines
- Heat treatment lines

SEAMLESS TUBE PLANTS

- Cross roll piercing mills
- PQF®-, MPM, and mandrel mills
- Assel mills
- Push bench/CPE/TPE mills
- Plug mills
- Hot pilger mills
- Expanders
- Sizing and stretch-reducing mills
- Cold pilger mills

WELDED TUBE PLANTS

- ERW welded tube plants for tubes up to 26"
- LSAW large-diameter pipe plants for pipes up to 64" (JCOE® and UOE process)
- Expanders
- Coil preparation
- Spiral pipe plants (online/offline process)
- Submerged arc welding plant for finish and rewelding
- Coating technology

TBK AUTOMATION AND MEASURING TECHNOLOGY

- Contour measurement with laser light section sensors for
  - wire and rod
  - light and medium sections
  - rails
  - heavy sections, large bars, and billets
  - tubes
  - special applications such as rings, wheels
- Waviness and straightness measurement
- Surface analysis

STRUCTURE OF SMS GROUP

DIVISIONS

FORGING PLANTS

FORGING PLANTS AND PRESSES

Open-die forging presses
Closed-die forging presses
Radial forging machines
Ring and wheel rolling machines
Forging manipulators
Extrusion presses

ALUMINUM PLANTS

Smelting furnaces
Casters (vertical/horizontal)
Homogenization plants
– Continuous homogenization plants
– Chamber homogenization plants
Charging machines
Ingot scalpers and turning equipment
Band saws
Plate stretchers
Extrusion presses for light metal
Drawing plants

COPPER PLANTS

Anode casting wheels – CONTILANOD®
Copper wire mills – CONTIROD®
Copper tube plants – directube®
Technica continuous casting plants (vertical/horizontal)
Extrusion presses for heavy metal
Drawing plants
Straighteners
Inner grooving lines

ADDITIVE MANUFACTURING AND POWDER METALLURGY

Powder atomization plants
Turnkey solutions on
AM volume production
AM applications
Powder presses

CONTIROD® is a registered trademark of Aurubis, Belgium.

TECHNICAL SERVICE

SPARE PARTS & LOGISTICS

OEM spare parts
Spare parts management
eService
Warehousing

UPGRADES & MODERNIZATION

Value added components
Mechanical, hydraulic, and electrical systems
Automation equipment

MAINTENANCE & REPAIRS

Troubleshooting
Maintenance service
Condition monitoring
Equipment checks

CONSULTING & TRAINING

TECademy specialist training
Fact-finding audits
Maintenance audits

ELECTRICAL AND AUTOMATION SYSTEMS

GENERAL SOLUTIONS

- Production planning and control systems
- Extensive process know-how in modular X-Pact® automation solutions
- Control and visualization systems
- Plant safety according to EU regulations
- Drive systems
- Energy supply and distribution
- Plug & Work testing and digital twins
- Hardware design and integrative engineering
- Full service 24/7 worldwide
- Digital solutions

Complete solutions for

- Metallurgical plants and environmental technology
- Flat rolling plants
- Long products
- Processing lines and furnace technology

SMS DIGITAL

SENSOR SYSTEMS

- Ladle tracking systems
- Torpedo-car-GPS tracking
- Process guidance
- Automatic tapping
- HD LASr
- Fiber optical mold sensor
- Ultrasound-based cast measurement
- Intelligent spindle
- Intelligent furnace
- Laser welding technology
- Rope monitoring

PROVEN PROGRAMS

- Production, planning, & logistics
- Product & quality
- Machine condition & maintenance

CENTRAL PLATFORM

- Genius CM®
- Performance Enrichment Analysis
- Smart Safety Guard
- Order Platform
- VR/AR simulation
- HD LASr
- Smart Alarm

PARTICIPATIONS

ELEXIS

- Strip and web guiding systems
- Quality assurance systems
- Drive technology
- Automated handling systems, plastics

ELOTHERM

- Hardening machines
- Inductive heating plants
- Laser exposure systems
- Inductive tube welding
- Inductive seam annealing
- Quench and temper lines

AMOVA

- High-bay warehouse systems
- Conveying systems
- Crane systems
- Packaging lines
- Grinding and inspection lines
- Surface treatment
- Driverless transport systems
- Port logistics
- Automation technology

GLOBAL OPERATIONS UNDERLINE OUR GROWING EXPERTISE

We respond to megatrends, and our excellent products provide the proof. On the following pages, you can find out how we work around the world to provide our customers with the best service in all our divisions.

MAJOR ORDERS AND COMMISSIONING PROJECTS

AT A GLANCE
OUR PROJECTS IN AMERICA

MAJOR ORDERS

IRONMAKING

U.S. Steel, USA; new gas cleaning plant for blast furnace No. 4

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

Nucor Steel Berkeley, USA; widening of caster B
Aceros Arequipa S.A., Peru; steel mill (EAF, LF, E&A) and billet caster with six strands

PROCESSING LINES AND FURNACE TECHNOLOGY

PEASA, Mexico; heat treatment line for tubes
Stelco, Canada; modernization of air knife system for a continuous hot-dip galvanizing line
U. S. Steel, Great Lakes Works, USA; modernization of air knife system for a continuous hot-dip galvanizing line

LONG PRODUCTS

Gerdau Petersburg, USA;
new lifting tables and inserts for tandem mill
Nucor Yamato Steel Company, USA;
new tandem mill stand group
Nelson Steel, USA; drawing line

FORGING TECHNOLOGY

Mid-States Aluminum Corp., USA;
28-MN extrusion press (in cooperation with OMAV)

TECHNICAL SERVICE

Spare parts & logistics

Aperam, Brazil; new SMS giant torque spindle, incl. oil-air lubrication and monitoring
thyssenkrupp, Danville, USA; clutch-brake unit
McInnes Rolled Rings, Erie, USA;
top axial gear unit and main roller gear unit
Tek Metals, Canada; spare parts for the electrode system
Kaiser Aluminum Corp, USA;
spare parts package for 82-MN plate stretcher
thyssenkrupp Crankshaft, USA;
spare parts (clutch-brake unit) for VP 1000
Ternium Mexico S.A., Mexico;
wheel set main gear unit F1 and pinion wheel set F1

Upgrades & modernizations

ArcelorMittal Tubarão, Brazil;
alteration of the slab caster molds on the cassette
Gerdau Açominas, Brazil;
new 3rd generation laying head for the wire rod mill
Gerdau, Brazil; increase of EAF capacity and design for the future installation of an EMS
Kaiser, Bellwood, USA; modernization of the hydraulics for the Sutton P7-5,000-ton extrusion and piercing press
Arconic, Lafayette, USA;
piercing piston for Sutton 5,000-ton extrusion press
Hydro Mountain Top, USA;
alteration of Sutton 5,000-ton extrusion press
McWilliams Forge, Danville, USA;
replacement of spindle and nuts of SPKA 9000
Nacional de Cobre, Mexico; modernization of two HC 880 BMI horizontal continuous casting lines

Maintenance & repairs

ArcelorMittal, Brazil; repair of the converter vessel by replacing plates and installing heat shield
ArcelorMittal, USA; 6-year service contract for the repair of caster mold and segment
North Star BlueScope, USA;
5-year contract for the repair of caster mold and segment
Wieland Copper, USA; new rotor for PSW 100

Training & consulting

Novelis, Brazil; evaluation study to increase the forces of the aluminum rolling mill

ELECTRICAL AND AUTOMATION SYSTEMS

Aceros Arequipa S.A., Peru; X-Pact® electrical and automation systems for a continuous billet caster
American Titanium Works (ATW), USA;
engineering for a heavy plate mill
Nucor Yamato Steel Company, USA; X-Pact® electrical and automation systems for modernization of a beam rolling mill

COMMISSIONING PROJECTS

PROCESSING LINES AND FURNACE TECHNOLOGY

- Nucor Steel Marion Inc., USA; walking-beam furnace
- Steel Dynamics, Inc. (SDI), USA;
  top and bottom-fired pusher furnace for billets

LONG PRODUCTS

- Steel Dynamics, Inc. (SDI), USA;
  new heating furnace and finishing equipment
- Tenaris Bay City, USA; PQF® seamless tube plant

FORGING TECHNOLOGY

- Weber Metals; USA;
  hydraulic 540-MN closed-die forging press

ELECTRICAL AND AUTOMATION SYSTEMS

- Essar Steel Algoma Inc., Canada;
  X-Pact® Level 2 system for a steel mill
- ArcelorMittal Dofasco, USA;
  X-Pact® Level 2 system for a steel mill
- Nucor Steel Berkeley, USA; X-Pact® electrical and automation systems for modernization of a CSP® hot rolling mill, phase 2
- Aleris Rolled Products, USA; X-Pact® electrical and automation systems for a cold rolling mill

AT A GLANCE
OUR PROJECTS IN EUROPE

MAJOR ORDERS

IRONMAKING

ArcelorMittal Group, Belgium;
turnkey construction of a recuperator

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

voestalpine BÖHLER Edelstahl GmbH, Austria;
electric steelworks with EAF, AOD converter and secondary metallurgy (two 50-ton VD and one 50-ton VOD)
Aurubis AG, Germany; three Peirce-Smith converters

FLAT ROLLING PLANTS

ArcelorMittal Bremen, Germany; modernization of finishing mill
NLMK DanSteel, Denmark;
modernization and expansion of heavy plate mill
Ilsenburger Grobblech GmbH, Germany;
heat treatment line with MultiFlex-Quench®
Tata Steel IJmuiden BV, Netherlands;
modernization of batch tandem mill CM 21

PROCESSING LINES AND FURNACE TECHNOLOGY

Aperam Stainless Belgium, Belgium;
annealing and pickling line for stainless steel cold strip
Tata Steel IJmuiden BV, Netherlands;
modernization of the continuous entry section

LONG PRODUCTS

Stahlwerk Thüringen GmbH, Germany; modernization of section mill with new CCS® universal stand
Lech-Stahlwerke, Germany; bright steel center
voestalpine, Austria; dishing press
Mannesmann Stainless Tubes, Germany; cold pilger mill
Vallourec, Germany; new rolling stands

FORGING TECHNOLOGY

Musashi Bockenau GmbH & Co. KG, Germany;
closed-die forging press MT 5000
Thöni Industriebetriebe GmbH, Austria;
extrusion press plant 55 MN
Gustav Grimm Edelstahlwerk, Germany;
31.5/34-MN open-die forging press
Hydro Ghlin, Belgium; multi-chamber melting furnace
Ecomelt PS200 and drossing machine

TECHNICAL SERVICE

Spare parts & logistics

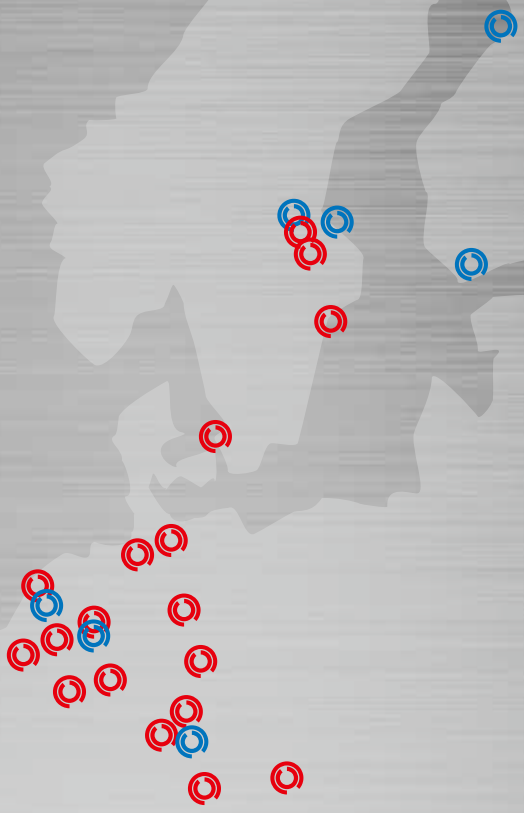
NLMK DanSteel, Denmark; CVC® shifting units
SSAB Oxelösund, Sweden; swivel roller and HGC cylinder
Outokumpu, Avesta, Sweden; eight CVC® blocks
Dillingen, Germany; several gear units
Daimler AG, Germany; spare part for AKP 3150
ArcelorMittal Belgium, Belgium; 22 oil film bearings for TCM

Upgrades & modernizations

Daimler AG, Germany; modernization of the pneumatics and hydraulics braking system for AKP3150
Zapp Precision Metals GmbH, Germany;
modernization of the shear
ST Extruded Products Group, Germany;
extensive modernization of the 20-MN extrusion press

Maintenance & repairs

BGH Edelstahl Siegen GmbH, Germany;
repair of the peeling machine
Peiner Träger GmbH, Germany;
repair of the slide plates in the heavy section plant
BGH Edelstahl Siegen GmbH, Germany;
repair of the peeling line WDH350
Maschinenfabrik GUIDO, Germany;
repair/maintenance of the KPW
NLMK La Louvière, Belgium; repair of the mill stand
SSAB Borlänge, Sweden; repair of two AGC cylinders
SSAB Oxelösund, Sweden; repair of two HGC cylinders
thyssenkrupp rothe erde GmbH, Germany;
replacement of the radial slide of the RAW 450/500
Hirschvogel, Marksuhl, Germany;
emergency repair of the EP2500
HMT Höfer Metall Technik, Germany;
new maintenance service contract for the extrusion presses



COMMISSIONING PROJECTS

Training & consulting

- Outokumpu Degerfors, Sweden; on-site hydraulics training

ELECTRICAL AND AUTOMATION SYSTEMS

- voestalpine BÖHLER, Austria;
  X-Pact® electrics and automation for a stainless steel plant
- Tata Steel IJmuiden BV, Netherlands; X-Pact® electrics and automation for a tandem cold rolling mill
- NLMK DanSteel A/S, Denmark; X-Pact® electrics and automation for a new laminar cooling system
- Aperam Stainless Belgium, NV, Belgium;
  X-Pact® electrics and automation for an annealing and pickling line for a stainless steel cold rolling mill
- Tata Steel IJmuiden BV, Netherlands;
  X-Pact® electrics and automation for the continuous entry section in the tandem cold rolling mill and the welder

NEW HORIZON

- CFL, Luxembourg;
  modernization of the stations in Rodingen and Mersch
- European Parliament, Luxembourg;
  upgrade of the Konrad-Adenauer Building
- AMAG Rolling GmbH, Austria; turnkey delivery and assembly of a high-bay warehouse for aluminum bars (CTI systems)
- Gebr. Kemper GmbH + Co. KG, Germany;
  implementation of an extensive logistics concept
- BST eltromat International for Tetra Pak, Germany;
  alteration and modernization of the web guide systems for reduced trimming losses

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

- SSAB EMEA AB, Sweden; repair of BOF top cone
- AB Sandvik Materials Technology, Sweden;
  AOD converter tilt drive

FLAT ROLLING PLANTS

- Aluminium Norf GmbH, Germany;
  assembly and commissioning of aluminum cold rolling mill

PROCESSING LINES AND FURNACE TECHNOLOGY

- SSAB Europe, Finland;
  modernization of a pickling line, incl. laser welder
- SSAB, Finland; modernization of a hot-dip galvanizing line incl. air knife system
- Tata Steel, Netherlands; modernizations of air knife system for continuous hot-dip galvanizing line

LONG PRODUCTS

- Lech-Stahlwerke GmbH, Germany; modernization of PSM®

FORGING TECHNOLOGY

- voestalpine BÖHLER, Austria; rapid forging press
- Wieland Austria, Austria; 50-MN extrusion press
- Trimet, Germany; continuous homogenizing and sawing plant

ELECTRICAL AND AUTOMATION SYSTEMS

- AMAG rolling GmbH, Austria; X-Pact® electrics and automation for an aluminum cold rolling mill and heat treatment line for carbon steel and aluminum

NEW HORIZON

- DB International, Germany;
  new ICE repair facility in Cologne-Nippes
- Bernard Krone GmbH & Co. KG, Germany; fully automated painting line for truck-trailer chassis (CTI systems)
- Avery Dennison Luxembourg S.à r.l., Luxembourg; handling system with high-bay warehouses for foil reels (CTI systems)

MAJOR ORDERS

IRONMAKING

ArcelorMittal Group, France;
turnkey construction of a recuperator
ArcelorMittal Group, Romania; modernization of a recuperator
ArcelorMittal Italia, Italy;
package with technological conversions and environmental improvements for upgrade of a coke oven plant
ArcelorMittal Dunkerque, France; first industrial Ciroval® plant for treatment of blast furnace sludges

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

Compañía Española de Laminación S.L. (CELSA), Spain;
modernization of beam-blank caster with CONDRIVE direct oscillation drive

FLAT ROLLING PLANTS

Marcegaglia Ravenna S.p.A., Italy; Compact Cold Mill (CCM®)
Elval Halcor, Greece; four-high aluminum hot rolling mill

PROCESSING LINES AND FURNACE TECHNOLOGY

U.S. Steel Košice, Slovakia; air knife system incl. strip stabilization
SN Seixal Siderurgia Nacional SA, Portugal;
walking-beam furnace for a bar mill
Tata Steel Zodiac, UK; modernization of air knife system for a continuous hot-dip galvanizing line

LONG PRODUCTS

Arlenico S.p.A., Italy; new MEERdrive®PLUS block
Feralpi Siderurgica S.p.A., Italy; new MEERdrive®PLUS block
Acciaiere Venete, Italy; black steel straightener
Železiarne Podbrezová, Slovakia; modernization of push bench
Arvedi Tubi Acciaio, Italy;
modernization of HF pipe welding line RD 170
Bornay S.L., Spain; new RD 40 HF pipe welding line

FORGING TECHNOLOGY

Garner Aluminium Extrusions Ltd., UK;
HybrEx®35 extrusion press
Exlabesa Extrusion Doncaster Ltd., UK; 35-MN extrusion press
Huta Bankowa Sp. z o.o., Poland;
RAW 200/160-3500/700 EH radial-axial ring rolling machine
FOMA S.p.A., Italy; overhauled type-SB5 spinner block with automatic tube preparation
Aludium, Spain; Ecomelt PS275 multi-chamber melting furnace
Constellium, Czech Republic; continuous homogenization plant, saw, and helical UT (ultrasonic testing)
Exlabesa, Spain; continuous homogenizing and sawing plant
ESTRAL S.p.A., Italy; HybrEx®28 extrusion press*
Aliplast, Poland; 25-MN extrusion press*
Impol, Slovenia; 25-MN extrusion press*

TECHNICAL SERVICE

Spare parts & logistics

Corinth Pipeworks (pipe plant), Greece;
delivery of expander segments

Maintenance & repairs

SAM Neuves Maisons RIVA Group, France;
repair of rolling mill stands of strand 1
ArcelorMittal, Poland; repair/maintenance of wire rod mill
Isdemir, Turkey; repair of all cylinders of the hot strip mill

Training & consulting

U.S. Steel Košice, Slovakia; HSM measurement

ELECTRICAL AND AUTOMATION SYSTEMS

ArcelorMittal España, S.A., Spain; X-Pact® electrics and automation for conversion of a 1x2 continuous caster
Elval Hellenic Aluminium Industry S.A., Greece;
X-Pact® electrics and automation for a finishing line in a four-high aluminum hot strip mill
Marcegaglia, Italy; X-Pact® electrics and automation for a two-stand reversing cold rolling mill

NEW HORIZON

Kalyon Insaat Sanayi, Turkey;
teleplatform system for Turkish Airlines (CTI systems)

* In cooperation with OMAV

COMMISSIONING PROJECTS

IRONMAKING

Acciaieria Arvedi, Italy;
urgent repair of blast furnace No. 3 in Trieste plant

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

PCC BakkiSilicon hf, Iceland; silicon production plants
ArcelorMittal Gijón, Spain;
new dedusting system for LD steelworks

FLAT ROLLING PLANTS

- Acerinox Europe, Spain; 20-roll cold rolling mill
- Impol Group Slovenia, Slovenia; commissioning and FAC of revamped aluminum cold rolling mill

PROCESSING LINES AND FURNACE TECHNOLOGY

- Wuppermann Hungary Kft., Hungary; hot strip pickling and hot-dip galvanizing line incl. laser welding machine
- Forjas Iraeta Heavy Industry, Spain; walking-beam furnace for bar steel
- U.S. Steel Košice, Slovakia; modernizations of air knife system for continuous hot-dip galvanizing line

LONG PRODUCTS

- Sidenor Aceros Especiales, S.L., Spain; modernization of merchant bar mill
- Třinecké železárny, Czech Republic; FAC for modernization of a blooming mill and hydraulic shear
- ArcelorMittal España S.A., Spain; modernization of rail mill
- Caleotto, Italy; MEERdrive®PLUS block
- Specitubes, France; two cold pilger mills
- Arvedi Tubi Acciaio, Italy; new welding table

FORGING TECHNOLOGY

- PARSAN Makina Parcalari Sanayii A.S., Turkey; AMP 2500 closed-die forging press
- Talum, Slovenia; continuous homogenizing plant
- Exlabesa, Spain; continuous homogenizing and sawing plant
- Impol, Slovenia; melting furnace and charging machine, 25-MN extrusion press
- HAI, Romania; chamber homogenizing plant and expansion of the existing UT (ultrasonic testing) system

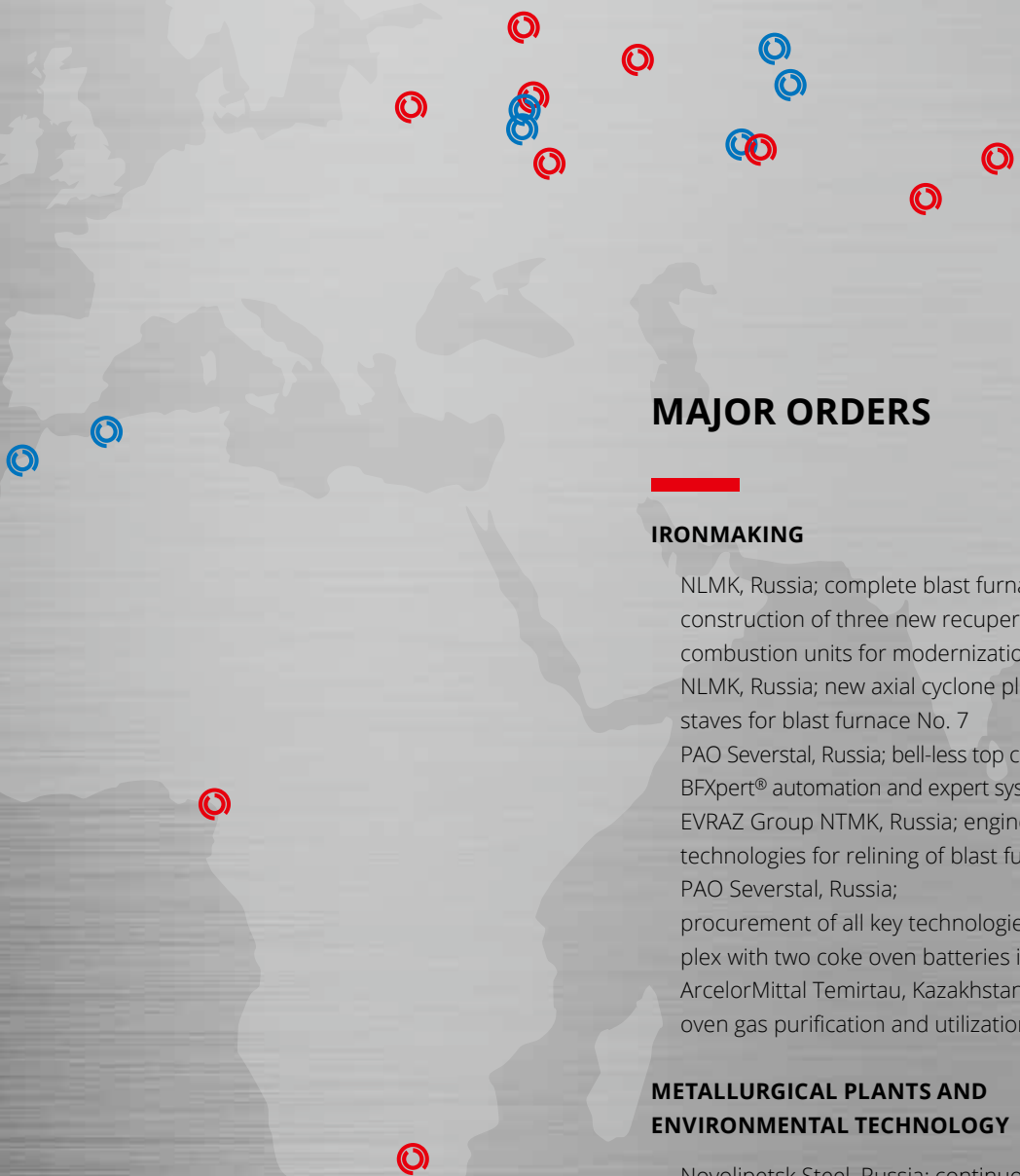
ELECTRICAL AND AUTOMATION SYSTEMS

- PCC BakkiSilicon hf, Iceland; X-Pact® electrics and automation for a silicon reduction plant
- SIJ ACRONI d.o.o., Slovenia; X-Pact® electrics and automation for modernization of a heat treatment line

NEW HORIZON

- YKK Italia S.p.A., Italy; cogeneration unit
- Airbus, France; complete dock system for Beluga XL transport aircraft (CTI Systems)

AT A GLANCE
OUR PROJECTS IN AFRICA AND THE CIS COUNTRIES



MAJOR ORDERS

IRONMAKING

NLMK, Russia; complete blast furnace gas plant and construction of three new recuperators with dome combustion units for modernization of blast furnace No. 4
NLMK, Russia; new axial cyclone plus cast iron and copper staves for blast furnace No. 7
PAO Severstal, Russia; bell-less top charging system and BFXpert® automation and expert system for blast furnace No. 3
EVRAZ Group NTMK, Russia; engineering and supply of core technologies for relining of blast furnace No. 6
PAO Severstal, Russia;
procurement of all key technologies for a new coking complex with two coke oven batteries in Cherepovets
ArcelorMittal Temirtau, Kazakhstan; modernization of a coke oven gas purification and utilization plant

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

Novolipetsk Steel, Russia; continuous caster

FLAT ROLLING PLANTS

Magnitogorsk Iron and Steel Works (MMK), Russia;
modernization of "2500" hot strip mill
PAO Severstal, Russia;
modernization of "2100" tandem mill (focus on exit area)

- PAO Severstal, Russia; modernization of "2100" tandem mill (focus on new drives for stands 2 to 4)

PROCESSING LINES AND FURNACE TECHNOLOGY

- ArcelorMittal Vanderbijlpark, South Africa; modernization of air knife system for three continuous hot-dip galvanizing lines

LONG PRODUCTS

- Prometal Aciérie, Cameroon; new section and wire mill

TECHNICAL SERVICE

Spare parts & logistics

- Magnitogorsk Iron and Steel Works (MMK), Russia; second new delivery of an SMS giant torque spindle, incl. oil-air lubrication
- Magnitogorsk Iron and Steel Works (MMK), Russia; delivery of CVC® bending blocks for "5000" hot strip line
- EVRAZ ZSMK (rail rolling mill), Russia; roller bearings
- Volsky, Russia; spare parts for casting plant
- ArcelorMittal Saldanha, South Africa; delivery of three pinion wheel sets and two spur gears for the main gear unit

Upgrades & modernizations

- ITZ, Russia; upgrade of tube expander and pressure testing, incl. delivery of a special tool set

Maintenance & repairs

- MMPZ, Belarus; "Technical Outsourcing Services" for the roll grinding workshop for the new cold mill complex
- JSC TNK Kazchrome, Kazakhstan; extension of the "Technical Outsourcing Services" full-service contract by five years

ELECTRICAL AND AUTOMATION SYSTEMS

- Novolipetsk Steel, Russia; X-Pact® electrics and automation for a slab caster
- PJSC Magnitogorsk Iron and Steel Works (MMK), Russia; X-Pact® electrics and automation for the modernization of a 2,500-mm hot strip mill
- PAO Severstal, Russia; X-Pact® electrics and automation for a coiler in a 2,100-mm tandem cold rolling mill

COMMISSIONING PROJECTS

IRONMAKING

- EVRAZ Group NTMK, Russia; new blast furnace No. 7 with Paul Wurth key technologies
- Tosyali Holding, Algeria; MIDREX NG™ direct reduction plant for 2.5 million TPY (Midrex Technologies Inc./Paul Wurth consortium)

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

- LLC Tulachermet Steel, Russia; steel and rolling mill complex
- Maghreb Steel, Morocco; electric steelworks and continuous caster
- Tosyali Iron & Steel Industry, Algeria; new billet caster with eight strands

PROCESSING LINES AND FURNACE TECHNOLOGY

- PJSC Magnitogorsk Iron and Steel Works (MMK), Russia; continuous hot-dip galvanizing line

FORGING TECHNOLOGY

- Kamensk Uralsky Metallurgical Works, Russia; plating line

ELECTRICAL AND AUTOMATION SYSTEMS

- LLC Tulachermet Steel, Russia; X-Pact® electrics and automation for a steel plant

AT A GLANCE
OUR PROJECTS IN ASIA AND AUSTRALIA

MAJOR ORDERS

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

Shandong Laigang Yongfeng Steel Corporation, China;
two new billet casters with five strands and
CONDRIVE direct oscillation drive
Nanjing Iron and Steel Group Co., Ltd., China;
new bloom caster with four strands

FLAT ROLLING PLANTS

Henan Tongren Aluminium, China; aluminum cold rolling mill

PROCESSING LINES AND FURNACE TECHNOLOGY

Shandong Ruifeng Stainless Steel Co., China;
continuous hot-dip galvanizing line
HBIS Laoting Iron & Steel Co., Ltd., China;
air-knife systems incl. strip stabilization

LONG PRODUCTS

Jianlong Beiman Special Steel Co., Ltd., China;
new high-speed wire rod mill
Lianxin Steel, China; TMbaR rolling mill
Shandong Laigang Yongfeng, China; TMbaR rolling mill
Fuzhou Wuhang Steel, China; new TMbaR rolling mill
Zhejiang Jiuli Hi-Tech Metals Co., Ltd., China;
three cold pilger rolling mills
Jiangsu ChangBao Precision Steel Tube Co, China;
PQF® seamless tube plant

FORGING TECHNOLOGY

Daye Special Steel Co. Ltd., China;
50-/60-MN rapid forging press
AVIC Guizhou Anda Aviation Forging, China;
RAW 400/200-2500/800 radial-axial ring rolling machine and
P6000-3 ring blank press
Sichuan Liuhe Forging Co. Ltd., China;
50-/55-MN- X rapid forging press and X-Forging Box
Ningbo Xusheng Auto Technology Co. Ltd., China;
MP 2500 closed-die forging plant and ARWS 1a

TECHNICAL SERVICE

Spare parts & logistics

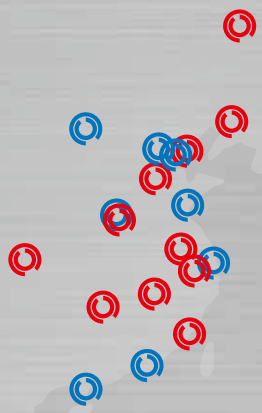
Angang Steel Company Limited, China;
delivery of two SMS giant torque spindles
Qingdao Special Iron and Steel Co., Ltd., China; gear unit
Handan Steel Group Han Bao Steel Co., Ltd., China;
hydraulic cylinder
Nanjing Iron & Steel Co., Ltd. (NISCO), China;
spare parts for top roll cartridges and roll mountings
Shougang Qian'an Iron & Steel, China;
HSM 2250 slab sizing press
Valin ArcelorMittal Automotive Steel Co., Ltd (VAMA), China;
CGL spare parts framework contract
Shandong, China; CGL spare parts package
Minmetals Yingkou, China;
delivery of an SMS giant torque spindle
Dongbu Steel, Korea; delivery of a rotary coiler for the
tandem cold rolling mill and a replacement cartridge for the
drum-type shear for the hot rolling mill

ELECTRICAL AND AUTOMATION SYSTEMS

Jiangsu Changbao Precision, China;
X-Pact® electrics and automation for PQF® plant 6 5/8

NEW HORIZON

China Southern Airlines, China; teleplatform system for
aircraft maintenance hall (CTI Systems)



COMMISSIONING PROJECTS

IRONMAKING

- Shandong Iron & Steel Rizhao, China; commissioning of a second new jumbo coke oven battery (engineering, core components, supervision services)

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

- Lianfeng Steel (Zhangjiagang) Co., Ltd (Yonggang Group), China; new billet caster with four strands

FLAT ROLLING PLANTS

- Shougang Jingtang Iron & Steel, China; completion of conversion of finishing stands in hot strip mill No. 2
- Shandong Iron & Steel Rizhao, China; FAC hot strip mill
- Tianjin Zhongwang Aluminium, China; expansion of the finishing mill
- Henan Mingtai Aluminium, China; FAC aluminum cold rolling mill

PROCESSING LINES AND FURNACE TECHNOLOGY

- Shandong Iron & Steel Rizhao, China; pickling/tandem mill, two continuous annealing lines, and a hot-dip galvanizing line
- Shandong Nanshan Aluminium Co., China; color coating line for aluminum can material
- Baotou Iron & Steel, China; air knife systems for two continuous hot-dip galvanizing lines
- Baosteel Zhanjiang Iron & Steel Co. Ltd., China; air knife system for continuous hot-dip galvanizing line

LONG PRODUCTS

- Guangdong Guoxin Industrial Co., Ltd., China; two high-speed wire rod mills
- Hejin Hongda Special Steel Co. Ltd., China; new high-speed wire rod outlet
- State Nuclear Baoti Zirconium Industry (SNZ), China; three cold pilger rolling mills

FORGING TECHNOLOGY

- Shandong Iraeta Heavy Industry Stock; China; RAW 2500/1250-16000/3000 radial-axial ring rolling machine
- Tianjin Zhongwang Aluminium, China; billet chamfering machine 2600
- Zhengzhou Mingtai, China; 82-MN extrusion press

ELECTRICAL AND AUTOMATION SYSTEMS

- Tianjin Zhongwang Aluminium, China; X-Pact® electrics and automation for a 1+5 aluminum hot rolling mill and for a three-stand aluminum tandem cold rolling mill

MAJOR ORDERS

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

PMB Silicon Sdn Bhd., Malaysia;
two electric submerged-arc furnaces for silicon
JSW Steel Ltd., India; new high-speed billet continuous caster with 5(6) strands and CONDRIVE direct oscillation drive
JSW Steel Dolvi Works, India; alteration of fume exhaust system
JSW Steel Ltd., India; 160-t electric-arc furnace
Tata Iron & Steel, India; TATA KPO Phase 2 caster
JSW Toranagallu, India; 160-t RH plant
JSW Dolvi, India; 350-t RH plant

FLAT ROLLING PLANTS

Gunung Steel Group, Indonesia; CSP® plant

PROCESSING LINES AND FURNACE TECHNOLOGY

Mukand Sumi Special Steel Ltd., India;
walking-beam furnace for SBQ bar and wire rod mill
PT Gunung Raja Paksi, Indonesia;
walking-beam furnace for section mill

LONG PRODUCTS

DaehanSteel Co., Ltd., South Korea;
modernization of merchant bar mill and VCC® plant
Mukand Sumi Special Steel Ltd., India; new SBQ rolling mill
Pohang Iron and Steel Company, South Korea;
modernization of wire and merchant bar mill
JFE Steel Corporation, Japan; new threading machine

FORGING TECHNOLOGY

LCG Aluminium Industries, India; 18-MN extrusion press
Seowon Co. Ltd., South Korea;
modernization of a continuous caster for brass

TECHNICAL SERVICE

Spare parts & logistics

SAIL, Rourkela Steel Plant, India;
delivery of segment assemblies for a slab caster
SAIL, IISCO Steel Plant, India;
delivery of main replacement parts for a steelworks
SAIL, Bhilai Steel Plant, India; various spare parts for operation and maintenance of the new universal rail mill
ArcelorMittal, Saudi Arabia;
delivery of a mandrel thrust bearing
Bharat Forge Limited, India; delivery of a forging press plunger for the KSP 800 wedge press
Alliance Steel (wire rod mill), Malaysia; ten bevel gear units
Kobelco Material, Thailand; clutch and push rod (KPW)
Dongbu Steel, South Korea; delivery and commissioning of a rotary coiler for the tandem cold rolling mill; delivery of a replacement cartridge for the drum-type shear in the hot rolling mill
GJ Steel, Thailand; spare parts for casting plant
Tokyo Steel, Japan; spare parts for lifting tables
LS Cable & System Ltd., South Korea;
central core part for cable sheathing press
POSCO Gwangyang Works, South Korea;
delivery of an SMS giant torque spindle, incl. oil-air lubrication and spare parts package
Tata Steel BSL Limited, India; delivery of an SMS giant torque spindle, incl. grease lubrication
Bhushan Steel & Strips Ltd., India; spare parts delivery for HSM

Maintenance & repairs

Hyundai Steel Co., South Korea; repair of cold drum-type shear
Taewoong Co., Ltd., South Korea; general overhaul of the main roll gear unit of the RAW 630/500

ELECTRICAL AND AUTOMATION SYSTEMS

PMB Silicon Sdn. Bhd., Malaysia;
power distribution station for submerged-arc furnace
Tata SteeL Ltd., India; X-Pact® electrics and automation for a two-strand-slab caster, phase II
Mukand Sumi Special Steel Ltd., India; X-Pact® electrics and automation for a merchant bar and wire mill
JSW Steel Ltd., India; X-Pact® electrics and automation for modernization of a hot strip rolling mill

NEW HORIZON

DP World, United Arab Emirates;
implementation and delivery of a high bay container storage system for the Expo 2020 world fair
TNG Ltd., Australia; (FEED) study for Mount Peake project

COMMISSIONING PROJECTS

IRONMAKING

SAIL, Steel Authority of India, Bhilai, India;
commissioning of the new blast furnace No. 8
SAIL, Steel Authority of India, Bokaro, India;
new construction of a coal processing and coke sorting plant next to coke oven battery No. 8
Tata Steel, Jamshedpur, India; commissioning of the first of two coke drying and cooling plants

METALLURGICAL PLANTS AND ENVIRONMENTAL TECHNOLOGY

- PMB Silicon Sdn. Bhd., Malaysia; two electric submerged-arc furnaces for silicon
- Jindal Steel & Power Ltd., India; new high-speed continuous caster with seven strands
- Jindal Shadeed Iron & Steel LLC, Oman; new high-speed billet continuous caster for SBQ steel grades with six strands

FLAT ROLLING PLANTS

- PT Gunung Raja Paksi, Indonesia; approval of the reversing cold mill (RCM)
- International Steels Limited (ISL), Pakistan; approval of the compact cold mill (CCM®) No. 2
- Hoa Sen Group, Vietnam; commissioning of the compact cold mill (CCM®) No. 3
- My Viet Industries, Vietnam; approval of push-type pickling line and compact cold mill (CCM®)

LONG PRODUCTS

- Hyundai Steel Co., South Korea; leveler
- Formosa Ha Tinh Steel Corporation, Vietnam; new billet rolling mill
- Alliance Steel, Malaysia; HSD® system
- Walsin Lihwa Corp., Taiwan; PM 160 peeling machine
- ArcelorMittal Jubail, Saudi Arabia; PQF® seamless tube plant

FORGING TECHNOLOGY

- SeAH Changwon, South Korea; 50-MN tube extrusion press line
- Ramkrishna Forgings, India; KP 12500 closed-die forging press
- Alba, Bahrain; chamber homogenizing plant and linear UT (ultrasonic testing)
- Hitachi Metals, Japan; 90/108-MN open-die forging press

ELECTRICAL AND AUTOMATION SYSTEMS

- PMB Silicon Sdn. Bhd., Malaysia; power distribution station for submerged-arc furnace
- PT Krakatau Steel, Indonesia; X-Pact® electrics and automation for a hot rolling mill

CONSOLIDATED FINANCIAL STATEMENTS AS AT DECEMBER 31, 2018

BALANCE SHEET in EUR thousand

ASSETS	Dec. 31, 2018	Dec. 31, 2017
Intangible assets	322,142	343,174
Property, plant, and equipment	619,077	651,763
Investments in unconsolidated, affiliated companies	11,699	14,222
Shares in investments accounted for using the equity method	67,639	45,730
Other equity investments	37,815	76,749
Investment securities	180,119	103,555
Deferred tax assets	121,154	88,678
Other non-current assets	65,438	107,791
Non-current assets	**1,425,083**	**1,431,662**
Inventories	813,336	823,123
Trade receivables	832,707	787,760
Receivables from income taxes	29,421	22,141
Other current assets	141,823	161,736
Securities	276,743	360,331
Cash and cash equivalents	685,175	787,840
Current assets	**2,779,205**	**2,942,931**
Total assets	**4,204,288**	**4,374,593**

LIABILITIES	Dec. 31, 2018	Dec. 31, 2017
Issued capital	10,000	10,000
Capital reserves	109,125	109,125
Retained earnings	607,005	582,482
Income and expense recognized directly in equity	20,666	9,383
Equity attributable to shareholders of SMS Holding GmbH	**746,796**	**710,990**
Non-controlling interests	116,002	111,380
Equity	**862,798**	**822,370**
Non-current financial liabilities	23,191	27,741
Provisions for pensions and similar obligations	701,755	716,659
Deferred tax liabilities	81,207	92,636
Other non-current provisions	54,072	48,578
Other non-current liabilities	31	4,371
Non-current liabilities and provisions	**860,256**	**889,985**
Current financial liabilities	55,148	44,524
Trade payables	381,741	376,282
Liabilities from income taxes	22,096	44,324
Advance payments received	664,622	609,268
Other current provisions	1,215,157	1,402,664
Other current liabilities	142,470	185,176
Current liabilities and provisions	**2,481,234**	**2,662,238**
Total liabilities	**4,204,288**	**4,374,593**

CONSOLIDATED INCOME STATEMENT in EUR thousand

	Dec. 31, 2018	Dec. 31, 2017
Revenue	**2,804,811**	**2,886,916**
Cost of sales	–2,266,863	–2,318,987
Gross profit	**537,948**	**567,929**
Selling costs	–292,124	–305,247
General administrative costs	–122,247	–128,654
Other operating income	47,821	63,168
Other operating expenses	–132,313	–219,637
Result from investments by equity method	4,471	1,869
Net investment loss	–651	140
Earnings before interest and taxes (EBIT)	**42,905**	**–20,432**
Net financial income	–16,200	43,340
Earnings before taxes (EBT)	**26,705**	**22,908**
Income taxes	–8,764	–21,991
Net profit for the year	**17,941**	**917**
Of which attributable to:		
Shares of the shareholders of SMS Holding GmbH	13,360	–5,034
Non-controlling interests	4,581	5,951

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SMS GMBH

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Machines, plants, and systems for producing and processing steel and nonferrous metals: submerged arc furnaces (SAF), basic oxygen steel-making plants (BOF, AOD), components and systems for dedusting electric furnaces and steel mills, electric steel mills (AC, DC), secondary metallurgy plants and processes, continuous casters for slabs and long products, combined continuous casting and hot rolling plants for the production of flat products (CSP®), minimills for long products, hot flat rolling and cold rolling mills, tandem trains coupled with pickling lines, finishing lines, powder coating lines, strip-processing and coating lines for steel and nonferrous metals (surface treatment and refining), drive systems, oil film bearings, electrical, automation, and control systems, hydraulic systems, oil lubricating and cooling systems, rolling oils and emulsions, water supply plants, seamless pipe plants, pipe welding plants, finishing plants and machines, milling and sawing machines for aluminum, long product and semi-finished goods rolling mills, wire rolling mills, hydraulic presses, extrusion presses, closed-die forging plants, ring and wheel rolling plants, transport and handling, warehouse technology, packaging machines, grinding plants, service.

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Steelworks and continuous casting technology for long products

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Induction technology, hardening plants, tempering plants

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OPPORTUNITIES OF DIGITALIZATION

SMS group


SMS group

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DIGITALIZATION AS A KEY TOPIC OF THE FUTURE

In talks with our customers, at trade shows, and when we discuss new projects, one topic dominates: digitalization. But is this nothing more than the latest hype? Absolutely not! We are certain that digitalization is one of the most important innovation drivers for the future of our industry. That makes it a key topic of further development. As long as it is strategically designed, solidly implemented, and effectively applied, digitalization will create vast competitive advantages, added value, and cost savings.

To be prepared for this development, SMS group has significantly expanded our competencies with the subsidiary SMS digital GmbH. As "The leading partner in the world of metals," we started at an early stage to develop groundbreaking and innovative solutions together with our customers. So we are ideally placed to substantiate the benefits, advantages, and successes of digitalization with facts and concrete experience. Big River Steel in the US and Shandong Iron & Steel Group Rizhao in China show how SMS group solutions already achieve digitalization of the entire value-creation chain, from liquid steel to the finished product. For the best results, we use perfectly meshed and interacting

digital solutions. Included here are our production planning system X-Pact® MES 4.0, which works with artificial intelligence and machine learning, our Product Quality Analyzer (PQA®) for digital quality monitoring and optimization across factories, and eDoc, which identifies spare parts directly on the machine so they can be ordered immediately.

However, digitalization makes sense not only in large projects. We also implement our new digital products even in small projects and revamps. It's important to us that every customer, at any time and whatever the nature of its data and systems, can advance into the digital future with us. We offer tailor-made, custom solutions to ensure this. Our focus is always on the benefits, high cost-efficiency, and future compatibility of our products.

Yet we always keep in mind the basis underpinning everything. Modern, future-oriented plant technology provides the foundation for the opportunities of digitalization. And this is the background we start from when we install and modernize plants.

We develop digital solutions not only for our customers, but also for our

SMS group. That means we continually improve our fitness for the digital future so we remain your strong partner, today and tomorrow. We are convinced digitalization will redefine the limits of technology. Together, we are already involved in shaping it and making the most of digital opportunities.

Burkhard Dahmen,
Chairman and CEO, SMS group

Prof. Dr.-Ing. Katja Windt,
CDO, SMS group

OPERATIONAL EXPERTISE

We provide customers with individual consulting and support them on their journey to their own digital transformation. One reason we are so successful in this area is that we draw on twin areas of expertise: digital competence and process understanding. Whatever we do, our focus is on customer benefit.

DATA ANALYSIS & DEVELOPMENT

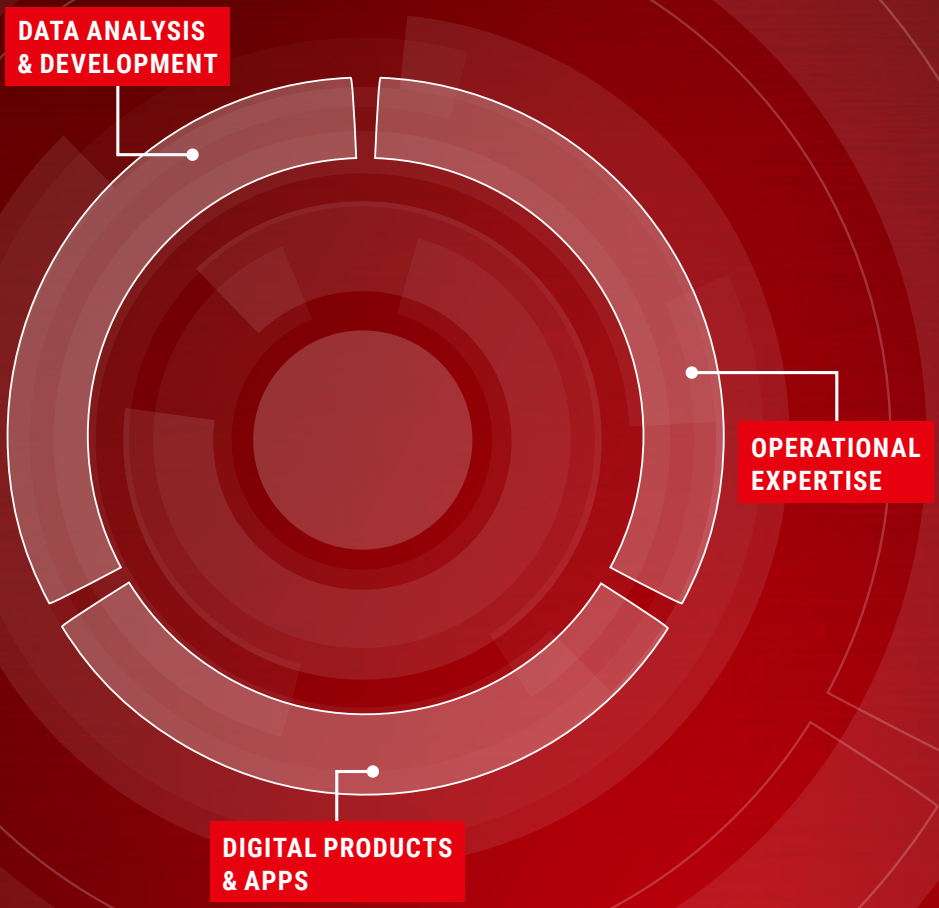
Unstructured data must be made usable because data is the basis for digitalization. With our Data Factory, we have designed the right product to generate premium data and extract insights from it.

DIGITAL PRODUCTS & APPS

Mature software offers multiple opportunities to optimize production, planning, logistics, or machine maintenance. There are also a number of small solutions with a big impact. We have created a practical platform named mySMS group.

HAND IN HAND TO AGILE TRANSFORMATION

Agile, step by step, together – this is our approach to the digitalization process. From consulting through generation of useful data, right up to concrete software solutions and apps. All centered on your market success.



GETTING READY FOR INDUSTRY 4.0

There's no need to fear change. Digitalization offers many opportunities. Instead of rigid, standard solutions, we build on individual consulting with a consistent focus on customer business success.

Digital transformation is a challenge for companies. Intelligent machines, components, and systems must be interlinked to ensure holistic product and process control. Many businesses find themselves entering new territory here. "We pick customers up from their current position, and dispel their doubts or possible fears about the changes digitalization involves," says Dr. Markus Reifferscheid, explaining the digitalization concept of SMS group.

Comprehensive consulting about digitalization is one of SMS group's major strengths. It can be divided into several areas. Personal contact is essential here. As ever, we make sure all projects are implemented in perfect partnership. Digital transformation should not complicate things, but simplify them. That's how it secures the future of companies. So our goal is increasing plant productivity and improving product quality while simultaneously reducing operating costs.

"We can advise customers comprehensively on how to approach digitalization."

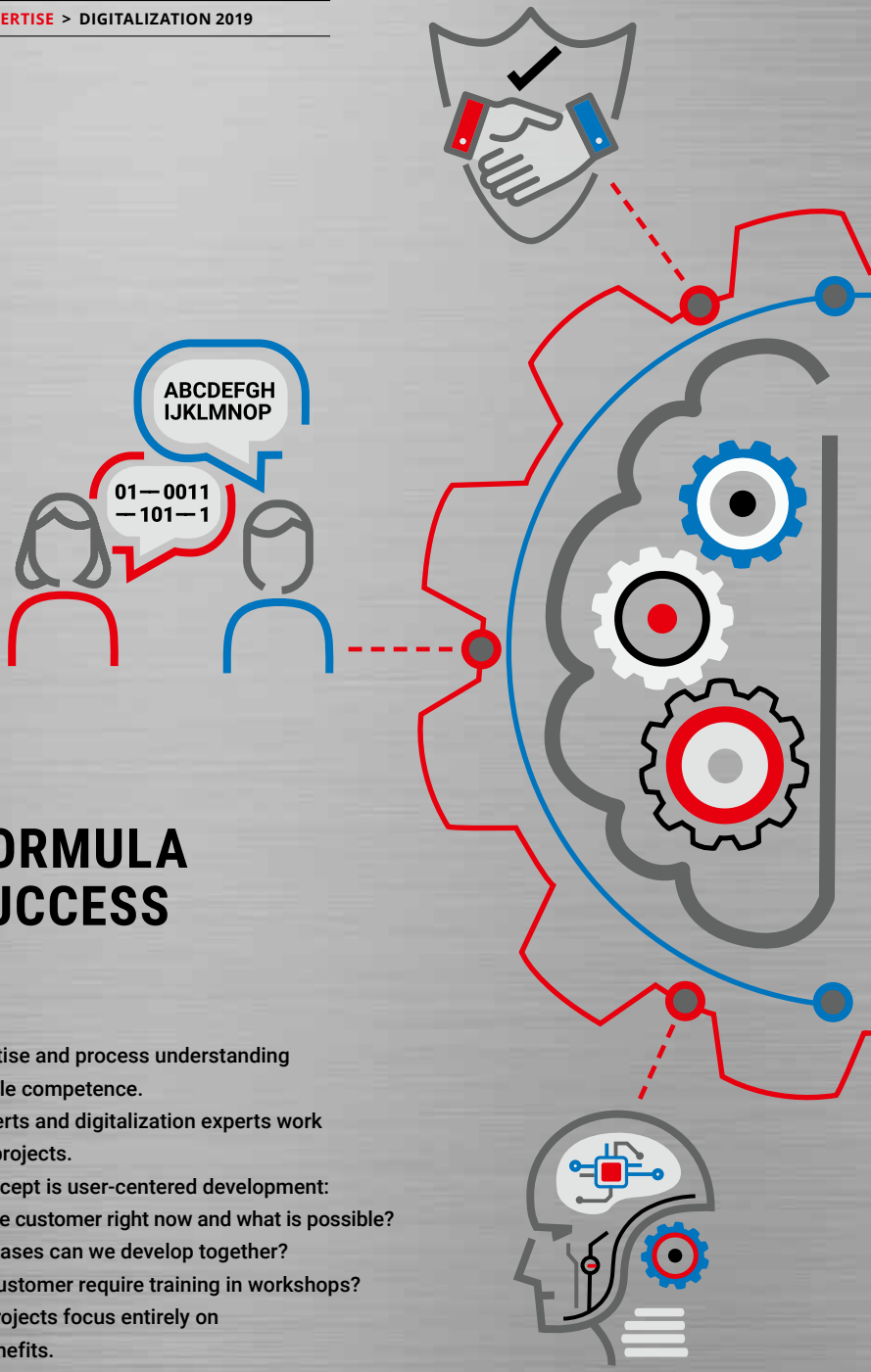
Dr. Markus Reifferscheid, Vice President Research & Development, SMS group and Managing Director, SMS digital GmbH

OPERATIONAL EXPERTISE

EFFICIENCY

PRODUCTIVITY

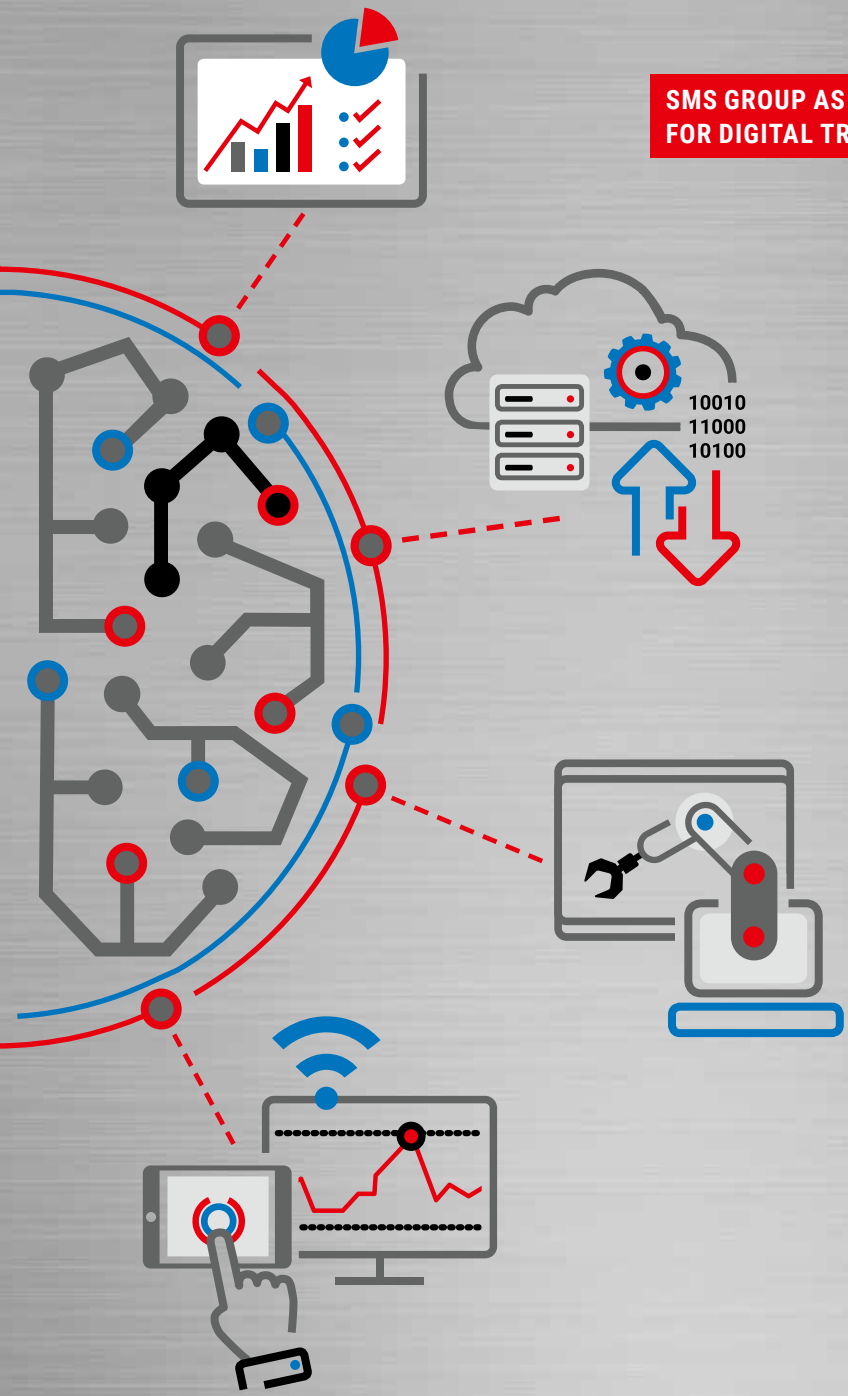
QUALITY



OUR FORMULA FOR SUCCESS

- Digital expertise and process understanding provide double competence.
- Process experts and digitalization experts work together on projects.
- The core concept is user-centered development:
  – Where is the customer right now and what is possible?
  – What use cases can we develop together?
  – Does the customer require training in workshops?
- The digital projects focus entirely on customer benefits.

SMS GROUP AS YOUR PARTNER FOR DIGITAL TRANSFORMATION



GAINING KNOWLEDGE FROM DATA

The right basis to create extra value: We start by working with raw data and transforming it into useful data. As a plant constructor, we have not only the digital expertise for this, but also the necessary technical know-how.

Crucial to the success of digital transformation is how a company deals with its data. SMS group uses tailor-made infrastructure plus suitable programs to transform raw data into useful data. "We take data and extract new insights for our customers, creating new value for them," says Prof. Dr.-Ing. Katja Windt, CDO of SMS group. This enables us to identify the interrelationships between different data and therefore also between process and product parameters. Then we provide digital solutions tailored to specific needs. As a plant constructor, we know exactly what data is important and how to evaluate it effectively.

"The basis is always well-functioning plant equipment and a modern automation package that controls the process. Digitalization comes on top of this," explains Dr. Markus Reifferscheid. The question then is how to create extra value beyond the existing solutions. We see the digitalization of a company as a process that we plan step by step in an agile way and in cooperation with the customer. The SMS expert teams work closely with your teams on-site, worldwide.

DATA ANALYSIS & DEVELOPMENT

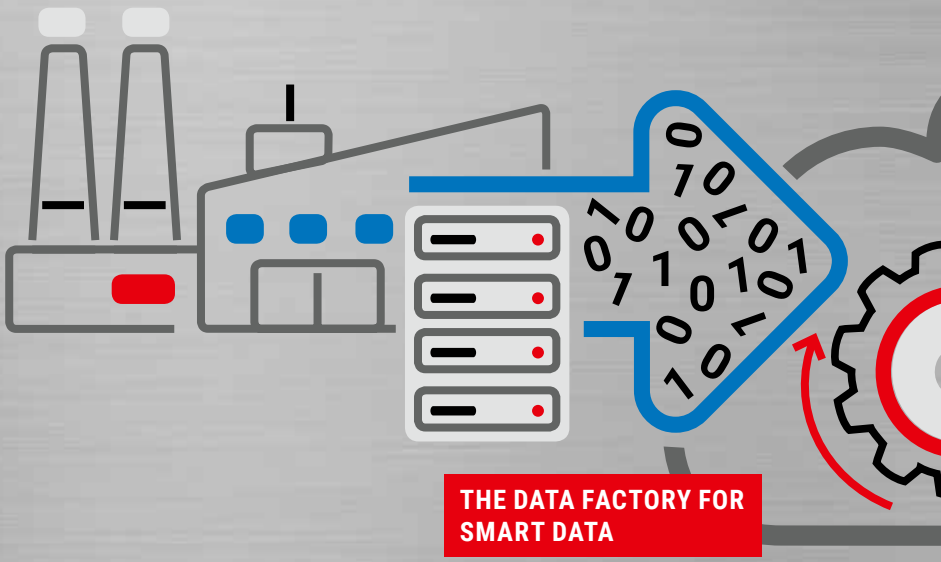
"A key aspect of digitalization is that it generates value from data."

Dr. Markus Reifferscheid, Vice President Research & Development, SMS group and Managing Director, SMS digital GmbH

DATA

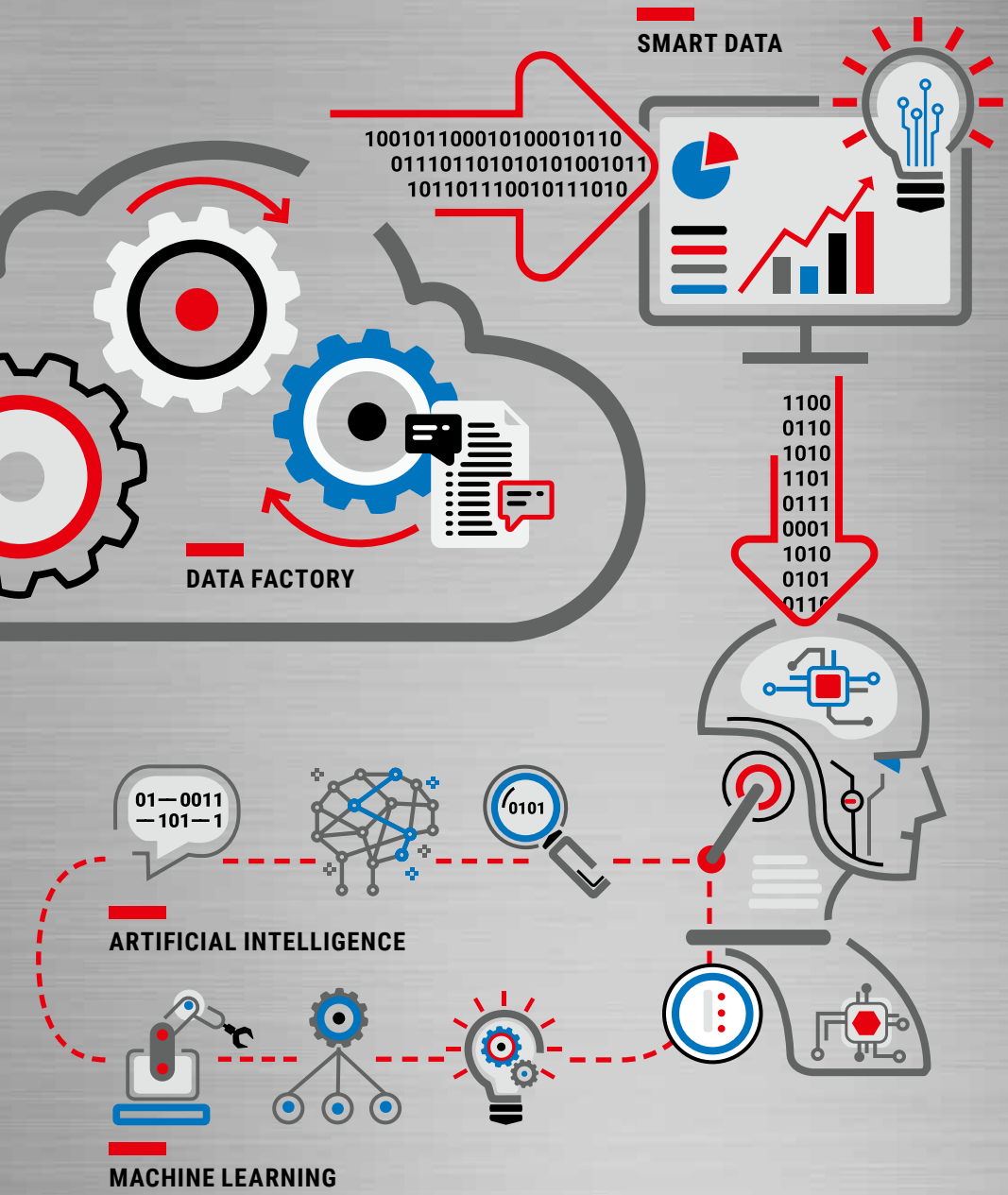
INFRASTRUCTURE

PROGRAMS



FROM RAW DATA TO DATA WITH ADDED VALUE

- The Data Factory converts unstructured data into homogenous premium data.
- The premium data is termed Smart Data.
- The data is not only read, but also interpreted.
- Smart Data is the basis for digitalization.
- Without Smart Data, there can be no software solutions or AI applications.


SMART DATA
1001011000101000101 10
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DATA FACTORY
1100
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1010
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0101
ARTIFICIAL INTELLIGENCE
MACHINE LEARNING

SUPPORT FROM DIGITAL PRODUCTS

Digitalization gives plant owners more efficiency, quality, and flexibility. The software provides the tools required. Often, small changes are all it takes to produce convincing results.

The right digital products and apps are essential for successful digital transformation of companies. To design suitable solutions, SMS group uses both SMS-developed sensor systems and systems from external suppliers. Effective software impacts on many areas in a company. That goes for production, planning and logistics, machine condition monitoring and maintenance, as well as product quality. At all these points, hundreds of digital products, services, and experts can provide support.

One very concrete form of support here is our digital platform mySMS group, devised especially for the metal industry. The smart applications are easy to use, reliable, always available, and enable you to digitalize your business. Our approach to digital transformation is “Think big, start small.” That is why we also supply a large number of small digital solutions and products. “Dozens of references show that even small changes can have worthwhile effects without a great deal of effort,” says Dr. Markus Reifferscheid.

"Think big, start small."

The SMS group approach to digitalization

DIGITAL PRODUCTS & APPS

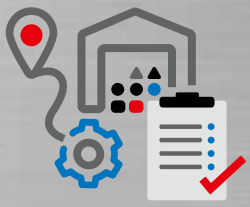
SENSOR SYSTEMS

SOFTWARE

DIGITAL PLATFORM

PRODUCTION PLANNING AND LOGISTICS

with Manufacturing Execution System



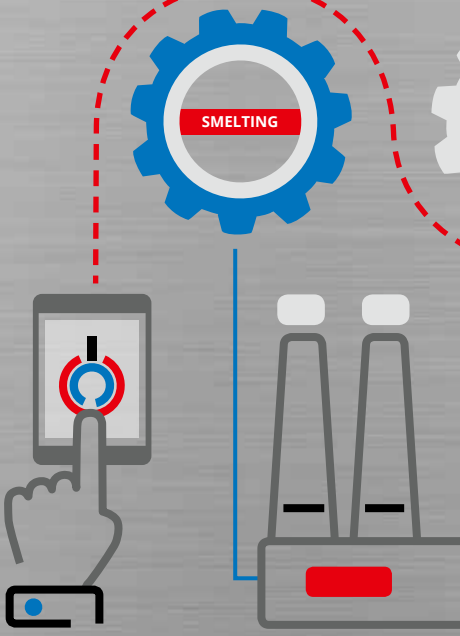
TAILOR-MADE SOLUTIONS FOR MARKET SUCCESS IN ALL AREAS

1 TO 2 %

PROFIT INCREASE

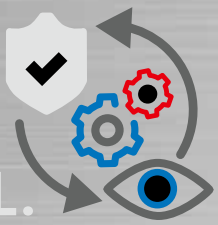
SENSOR SYSTEMS AND SOFTWARE FOR PREMIUM DATA

- State-of-the-art technologies for smelting, casting, rolling, and processing.
- Examples are Torpedo-car-GPS tracking, ultrasonic casting measurement, intelligent spindles, and laser welding technology.
- Advantages: factory-wide order planning and tracking, monitoring of product quality, and an increase in plant availability.
- Customer benefit: the processes are supported by hundreds of digital products, services, and experts



QUALITY MONITORING IN THE PRODUCTION PROCESS

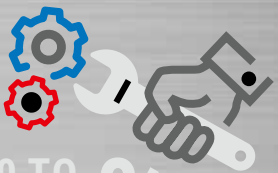
with Product Quality Analyzer



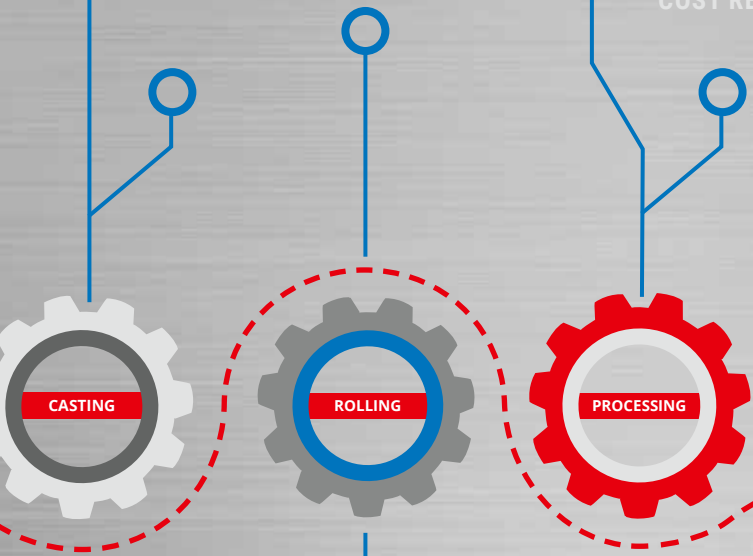
1 TO 20 MILL.
SALES INCREASE

PLANT AVAILABILITY AND MAINTENANCE

with Integrated Maintenance Management System

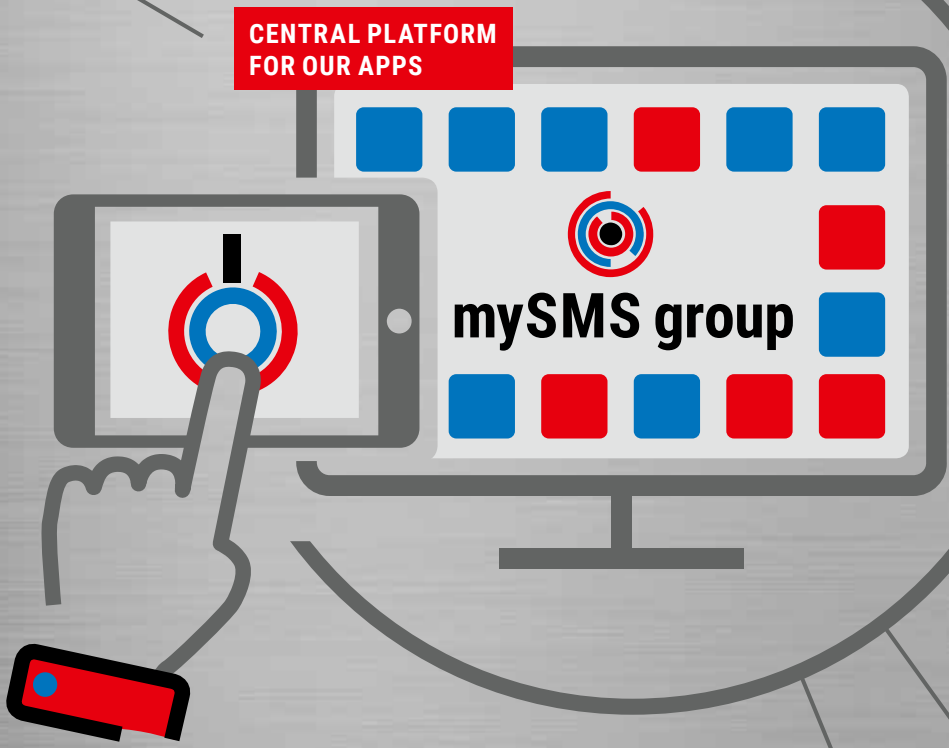


10 TO 15 %
COST REDUCTION



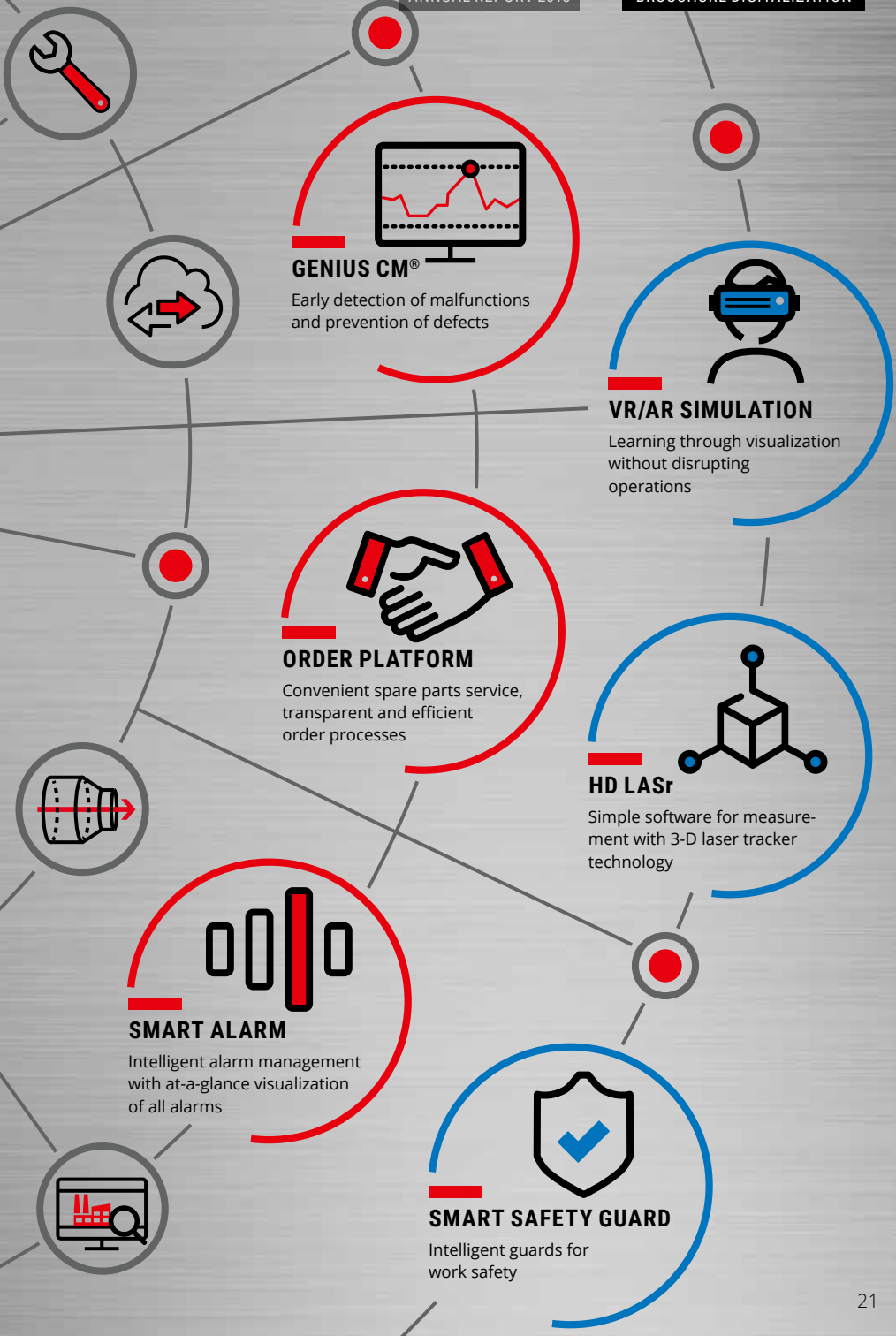
PREMIUM DATA

for optimization of the value-creation chain



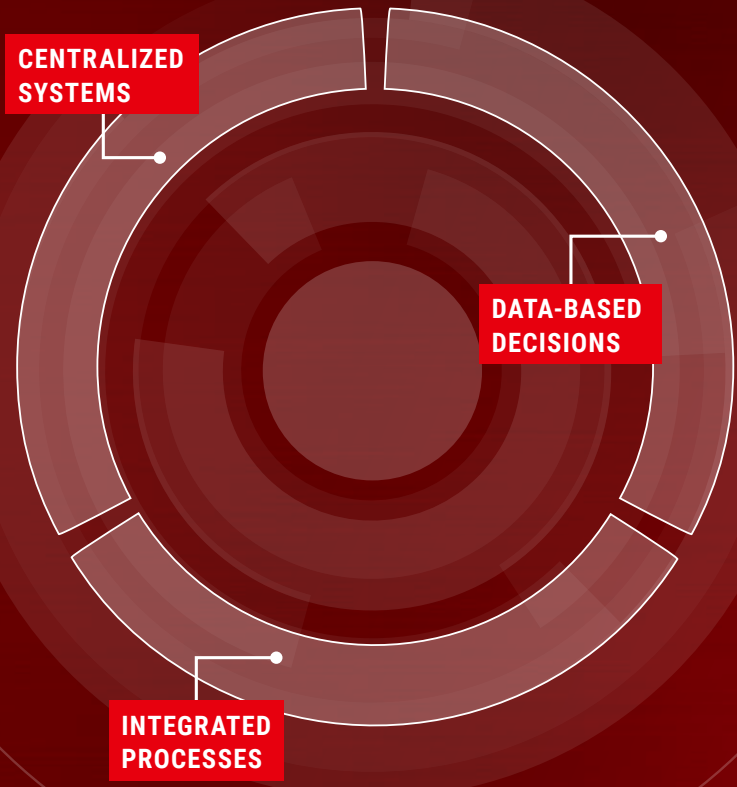
DIGITAL PRODUCTS, APPS, AND SERVICES FOR YOU

- You can access a whole range of apps on the mySMS group platform.
- The apps are available at any location and any time.
- Apart from the apps, we supply technologies, simulations, and intelligent programs for process optimizations.


GENIUS CM®
Early detection of malfunctions and prevention of defects
VR/AR SIMULATION
Learning through visualization without disrupting operations
ORDER PLATFORM
Convenient spare parts service, transparent and efficient order processes
HD LASr
Simple software for measurement with 3-D laser tracker technology
SMART ALARM
Intelligent alarm management with at-a-glance visualization of all alarms
SMART SAFETY GUARD
Intelligent guards for work safety

NEW STRATEGY

We are dedicated to process optimization not only for our customers, but also for our own company. To achieve this goal, we are applying our “IQ” strategy, “Learning Company,” and many more new ideas. This is how SMS group can be a successful digitalization role model.


CENTRALIZED SYSTEMS
DATA-BASED DECISIONS
INTEGRATED PROCESSES

USING DATA-BASED KNOWLEDGE FOR SMART PROCESSES

Managing information has become an ever-expanding field of activity for us. Today, it is still necessary for humans to coordinate and interpret data. That will change. To remain competitive, companies must digitalize their processes.

CENTRALIZED SYSTEMS

The SMS group IT systems store millions of pieces of data that contain different information but are saved in isolation from each other. This decentralization will soon be a thing of the past, because we plan to bring together data, systems, and applications. That will vastly increase the usefulness of data-based knowledge.

INTEGRATED PROCESSES

Especially due to the global network of SMS group, interlinked cooperation is a core competence. The IT architecture must be structured so that all participants in a project can work together worldwide on a common basis. That is what makes integrated processes as well as working in a single world possible.

DATA-BASED DECISIONS

Evaluating situations and responding correctly – this is an integral part of the business of SMS group. The information provided by data can be an effective support. Transparent, robust processes are essential so that data can be used efficiently in daily operations.

WE LIVE DIGITALIZATION

How does SMS group see digitalization in the context of internal processes? Dr. Dirk Oedekoven, Head of Information and Quality Management, explains the company's approach in this interview.

Digitalization is changing not only the industry and cooperation with customers, but also SMS group itself. What exactly are these internal changes?

Dr. Dirk Oedekoven: To answer that, we first have to look at how SMS group makes money today. The machine processing of metal is only responsible for a fraction of our value creation. Managing information accounts for the major part. Examples range from engineering models to drawings, programs, project structure plans, and contracts, up to SAP and e-mail-based project organization. All these items of information are saved in isolation in millions of items of data stored in our many IT systems. At present, data interpretation, correlation, and coordination still have to be performed by humans. That's because first, our systems can't yet communicate with each other sufficiently. And second, our current systems can only interpret a small proportion of the data. The result is that we only use a fraction of the knowledge contained in our data.

How can you solve this problem?

The solutions on the market are getting more effective and developing rapidly. What's more, we operate in a market environment that demands high process flexibility. Right up to the last day on the construction site, customers can require changes. Processes and IT are closely connected. Our job is to develop an architecture and organization for data, processes, and systems that enables us to extract valuable information from our data. We need to

“We must succeed in using the entire store of knowledge in our vast collection of data.”

act so we stay competitive with our business model.

What exactly is happening under Task Force '21, SMS group's transformation program?

First of all, we defined important organizational changes. We can only achieve successful digitalization if we work intensively on our processes. In our new "IQ" organization unit, we bring together the areas information management (IT) and process & quality management (PQ). This will ensure a stronger linking and governance of processes and systems. Our "IT Landscape" central project analyzed our IT and process landscape.

What conclusions have you drawn from these analyses?

We now know that trouble is rarely caused by a single system. It is our attempts to simultaneously map lots of uncoordinated variants of a process stage that create problems. Above all, achieving the goals I mentioned before is unrealistic with the multitude of systems we have and our conventional interface strategy.

That's the reason for our fresh approach with our new IQ strategy. We will no longer try to set up individual interfaces from one system to another. Instead, we are developing a central integration level that every system will be connected to via just one interface. As soon as a system is linked up, it can directly interact with all other connected systems. This is how we are creating the basic conditions for successfully combining processes and systems in the future.

What does the term "Learning Company" mean? Is it the same idea as the "Learning Steelworks"?

Yes, absolutely. The Learning Company also means bringing together the huge volume and variety of available data so we can use it efficiently. For SMS group, it's about doing justice to our extremely dynamic and complex business environment. We must, at all times, be able to evaluate each situation correctly and react appropriately. To do this, we have to strengthen two characteristics of our company even more: the ability to make data-based decisions and to work in integrated processes.

What does that mean exactly?

Everybody must have all the information relevant to the task at all times. We want to adopt the kind of "app feeling" we have in our private lives at work as well. Whether project managers or staff on the construction site, everybody should be able to see at a glance what's happening elsewhere in the project. Will a part arrive late? Does the project planning have to be changed? Are the costs developing on track? What options can be immediately put into action?

How important is the global network of SMS group with regard to internal digitalization?

It's enormously important for us because we have projects that involve all our locations around the world. So of course we have to build an IT architecture that enables us to work together seamlessly. We don't have that today. It must be our goal to work in one world and use global resources. It doesn't matter whether part of a project is tackled in Italy, India, or China – it must be an integrated process.

"It's about doing justice to our extremely dynamic and complex business environment."

How does digitalization affect the cooperation between the individual departments in SMS group?

The SMS group strategy is to operate as a full-liner. As a result, we not only benefit from considerable synergies, but we also want to offer our customers complete solutions from one source. This approach also offers enormous potential in terms of digitalization.

However, we must make no compromises in organizing our company according to this structure. That means standardizing processes, consolidating systems, and establishing central data management. We are on the cusp of a cultural transformation that is probably our greatest challenge ever. Everybody must contribute to change by being willing to critically examine his or her own way of working.

That's because the difference in global competition will not depend on who has the best software, but on who achieves the best symbiosis between humans, processes, and IT.

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