

# steel

## compact



bluemint® Steel

# bluemint® Steel

Our high-quality and certified flat steel  
with reduced CO<sub>2</sub> intensity

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thyssenkrupp



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“With bluemint® steel,  
we offer our customer  
high-performance steel  
with reduced CO<sub>2</sub>  
intensity.”

**A**t the end of September, thyssenkrupp Steel joined the “Race to zero” initiative of on occasion of the Climate Week of the United Nations. We thereby commit ourselves – together with ten other German companies and another 1,300 companies from all over the world - to do everything in our power to limit global warming to 1.5 degrees. As a steel company, we are well aware of our responsibility, but also of the enormous opportunity to make our contribution to this goal.

We are therefore proud to have reached another important milestone on our path towards the transformation to climate-neutrality. Under the umbrella brand bluemint® Steel, we have launched bluemint® pure, our first product with reduced CO<sub>2</sub> intensity. bluemint® pure is produced with real CO<sub>2</sub> savings. The CO<sub>2</sub> reduction method has been audited and assured by the international certifier DNV. Moreover, our approach is in line with the standards of the internationally recognized Greenhouse Gas Protocol. The Wuppertal Institute has also confirmed our approach as an important element of our comprehensive decarbonization strategy for steel production.



**Bernhard Osburg,**  
CEO thyssenkrupp Steel Europe AG

Our first client is the Ahlen-based premium bathroom solution provider Kaldewei to whom we delivered the first CO<sub>2</sub>-reduced blanks.

The launch of the bluemint® product line of CO<sub>2</sub>-reduced steel also proves that it is our ambition to offer certified products with a reduced CO<sub>2</sub> intensity as soon as possible. To this end, we are exploiting all the possibilities that we consider promising within the framework of existing blast furnace-based technology in an effort to increase the quantity of CO<sub>2</sub>-reduced products to 500,000 tonnes by 2024.

However, the next key step is the technology change to direct reduction. We are planning to commission the first plant in 2025, and the second four years later. By 2030, three million tonnes of bluemint® Steel are expected to be produced this way. Read more about our new bluemint® Steel product family in our title story.







# Investment in best surface quality

As part of its Strategy 20-30, thyssenkrupp Steel is investing in its capacities for best surface quality of premium sheet steel. Two new walking beam furnaces are scheduled to start up in the revamped Hot Strip Mill 4 in Duisburg-Bruckhausen in 2024. The key benefits: The units being built are state-of-the-art in terms of fuel consumption, emissions and high-quality slab surfaces. The new walking beam furnaces ensure that surface defects are avoided during reheating and rolling of slabs. Also, the heating process is more uniform.

# Knowledge & value

## Steel scrap



## Turning old into new

Discarded household appliances and many other everyday items contain an important resource: steel scrap. Unlike other materials, scrap iron can be recycled as often as you want. Nevertheless, the amount of scrap used in the production of high-quality primary steel has so far been rather low. The reason for this is the fact that scrap isn't made up of just one type of metal but of lots of different metals and grades. This makes it difficult to produce steels with specific material properties. thyssenkrupp Steel and recycling specialist TSR want to change this by means of an innovative production process that turns conventional scrap into a high-quality secondary raw material. This process is set to be tested in the blast furnaces of thyssenkrupp Steel and optimized with the aid of a wide range of measuring instruments. Following a successful trial phase, the new production facility is scheduled to go on stream in the fall of 2022.



**thyssenkrupp Steel – across all channels!**

Stay up to date about the latest trends in the steel sector. Follow us online! We are present on all popular social media channels.

Schwelgern 1 is one of the larger blast furnaces of its kind and smelts around 3.6 million metric tons of pig iron per annum.

## The final shift



It's not something that happens every day: This summer, our blast furnace "Schwelgern 1" was shut down after 13 years of continuous operation. Then, in October, following a complete overhaul, it was relit to begin its final shift.

Above all else, relining a blast furnace is usually one thing: time-consuming. It takes a week just to cool it down. Only then can its insides be inspected, renovated and, if necessary, new technology installed. In the case of Schwelgern 1, however, this shutdown involved just a minor intervention, with the refractory lining being renewed. But even a routine operation needs to be well planned – after all, the immobilized patient was unable to produce pig iron over a period of several weeks. In 2020, this blast furnace had already been equipped with SIP technology – an innovative process

thyssenkrupp Steel played a major role in developing. Since then, additional oxygen has been injected, improving the gas and liquid flows and thus increasing the efficiency of the furnace. As a result, the upgraded leviathan will in future emit less CO<sub>2</sub> into the environment. Still, this is likely to be the 48-year-old's final shift: From 2025, furnaces like this one will gradually be replaced by climate friendly direct reduction plants, which can run on green hydrogen. So it'll be "Bye-bye, Schwelgern 1" by 2050 at the very latest.



## In numbers

# 150 years

of steel history and stories are bound up with the **Westfalenhütte in Dortmund**. On September 1, 1871, the Hoesch family of industrialists founded the Eisen-und Stahlwerk Hoesch here on this site. The 15-part audio podcast entitled "Countdown Hoesch" tells the eventful history of the company, which merged into the Krupp Group in 1992 and has been part of thyssenkrupp Steel since 1997.



**bluemint® Steel gives our customers the certainty that they are using high-quality flat steel with reduced CO<sub>2</sub> intensity."**

**Bernhard Osburg,**  
CEO of thyssenkrupp Steel

➤ More info on page 8





## Cooperation

## Partnering for the climate

Good neighbors help one another. And the same goes for the two long-established Duisburg companies thyssenkrupp Steel and the brewery König-Brauerei. In the future, the latter will use the waste heat from thyssenkrupp's steel production to further reduce its own CO<sub>2</sub> emissions. This partnership will enable the brewer to make all of their production processes that require thermal energy climate-neutral. The steam will be delivered to the brewery via a new pipeline. This is where E.ON, the third cooperation partner, comes into play: The energy partner will build the infrastructure and handle the energy management side. This pioneering energy supply is scheduled to begin in the spring of 2022.

## The industry in brief

## Hydrogen to the rescue!

Compared with other sectors, the steel industry has the greatest leverage for CO<sub>2</sub> reduction through the use of hydrogen. The use of 1 ton of H<sub>2</sub> saves 26 tons of CO<sub>2</sub> here. In the chemical industry, aviation and shipping, too, hydrogen from green, climate-neutral sources and its derivatives are regarded as key elements of the decarbonization strategy. A meta-study commissioned by the Nationaler Wasserstoffrat (National Hydrogen Council) shows how high future demand for hydrogen will be.

## Forecast demand for green hydrogen and derivatives:



## Hydrogen production in Germany today:

**57 TWh**  
per year

(Based on fossil fuels)

## 3 questions for ...



**Barbara Timm**, Head of Technical Customer Service at Precision Steel

### 1 Ms. Timm, what exactly is precidur® from thyssenkrupp Steel?

For our customers, precidur® is an all-round care-free package. They are supplied with precision strip that is tailor-made in terms of strip geometry and material properties. It also offers additional advantages in terms of support: Customers are able to track the production status of their orders online or via our customer app 24/7. They are also assigned a personal contact from our Technical Customer Support department, who ensures that all customer requests are met with the highest priority. This, of course, also greatly strengthens process reliability in general.

### 2 You mentioned the precision of the strip geometry. What exactly does that mean?

When manufacturing precision strip with a thickness of 4 mm, we guarantee a maximum deviation of  $\pm 0.04$  mm over the entire length and width of the strip. That's less than half the diameter of a human hair. This is an extremely tight tolerance and a global USP of precidur®. By the way, while we're on the subject, we're particularly proud of our SmartCrown® technology, without which we wouldn't be able to manufacture precision strip in the first place.

### 3 What's so special about SmartCrown® technology?

SmartCrown® is an innovative rolling technology that has a particularly positive impact on the transverse profile. Specifically, if a customer requires such a degree of precision, this technology enables us to minimize the reduction in strip thickness from the center to the rolled mill edge. This increases not only the material's utility but also its quality. What's more, SmartCrown® also helps us to fully exploit cost reduction potentials.

## Web

For more information, go to:  
[www.thyssenkrupp-steel.com/advantages-of-precidur](http://www.thyssenkrupp-steel.com/advantages-of-precidur)

## Product news



## Safety for electric cars

Cold-rolled complex-phase steels are the product of choice for crash relevant structural components in electric vehicles, too. They ensure that in the event of a crash, deformation is kept to a minimum despite the high level of energy from the impact. Specifically, CP-K®780Y980T +Z combines high hole expansion with outstanding bendability and higher yield strength. The new grade has a tensile strength of 1,000 MPa and closes the gap between the CP-K® 800 and CP-K® 1200 grades. It is always supplied hot-dip galvanized and is available in thicknesses of 1.00 to 2.00 mm and widths of 1,000 to 1,450 mm.

For more information on our portfolio of multiphase steels, go to:  
[www.thyssenkrupp-steel.com/en/complex-phase-steel](http://www.thyssenkrupp-steel.com/en/complex-phase-steel)

# High quality, that's



## bluemint<sup>®</sup> Steel



# less CO<sub>2</sub> – bluemint® Steel

bluemint® Steel is thyssenkrupp Steel's first certified series of flat steels with reduced CO<sub>2</sub> intensity. These new products are manufactured at our Duisburg plant and give our customers the certainty of using high-quality steel with an improved ecobalance. One of the very first customers is the German premium bathroom product manufacturer Kaldewei.

**Text** Jan Ritterbach

It is a further step towards a climate-neutral steel industry: From now on, thyssenkrupp Steel will market all its CO<sub>2</sub>-reduced steels under the umbrella brand bluemint® Steel: bluemint® pure, certified by the DNV test institute, is the first of this series. TÜV SÜD has also certified bluemint® recycled, which is based on a specially processed scrap product. The savings potential of these CO<sub>2</sub>-reduced products is enormous: With each metric ton of bluemint® pure they purchase, customers save 1.5 metric tons of CO<sub>2</sub> compared to the same amount of conventionally produced steel.

Production of this new product at our Duisburg plant is 100 percent carbon-free in terms of the ecobalance. 0.6 tons remain due to the emissions during the “upstream chain”, i.e. all process steps that take place prior to production in Duisburg – such as the mining of raw materials and transport. This corresponds to a carbon reduction of in total some 70 percent. In the case of bluemint® recycled, the savings amount to 1.35 tons of CO<sub>2</sub> – equivalent to a reduction of 64 percent. >

## bluemint® Steel certification

Implementation of the CO<sub>2</sub> savings measures and the resulting tonnages of bluemint® pure and bluemint® recycled produced will be regularly audited. The certificates will show the carbon intensity as well as the quantity of CO<sub>2</sub> (in the case of bluemint® pure) and the specific emissions (bluemint® recycled), respectively. They will be supplemented by transparent reports on process mechanisms and on the rules and system boundaries implemented.

› The savings are made directly on site at our Duisburg production plant. This is made possible, among other things, by technical processes in which, in the case of bluemint® pure, already reduced sponge iron, specifically hot briquetted iron (HBI), and in the case of bluemint® recycled, 100 percent recycled steel scrap, replaces the coking coal in the blast furnace process on a proportional basis. In the future, the bluemint® Steel product family is set to be expanded to include a steel produced in innovative direct reduction plants that are fired with hydrogen.

## Kaldewei trusts in bluemint® pure

In view of the challenges associated with climate change and opportunities in future markets, the concept of low carbon steel is attracting the attention of many processing and end-user industries. bluemint® recycled is primarily targeted at customers for whom a high proportion of recycled materials is important, while bluemint® pure is particularly attractive to customers who supply to end-user markets. One example is the German premium bathroom product manufacturer Kaldewei, which in the future will be putting its trust in bluemint® pure for the production of a limited-edition line it has dubbed “nature protect”. “bluemint® pure offers us the certainty of already being able to use the highest quality steel at a low carbon intensity for the production of our steel enamel bathroom solutions. This is an important step towards achieving our climate targets. With bluemint® steel from thyssenkrupp, we are clearing a major hurdle on the way to Kaldewei’s climate-neutral orientation”, explained Kaldewei’s Managing Director, Franz Kaldewei, at the handover ceremony for the first blanks made of bluemint® Steel, at which Bernhard Osburg, CEO of thyssenkrupp Steel, was also present. “Kaldewei wants to do more than simply purchase carbon offsets. It is the first manufacturer to market a product founded on genuine carbon savings, manufactured from our CO<sub>2</sub>-reduced bluemint® pure,” added Osburg.

## Ecobalance testifies to zero emissions at production site

Like all other customers, Kaldewei benefits from the fact that external verification and certification of our process chain by DNV substantiates the CO<sub>2</sub> savings achieved by bluemint® pure. bluemint® pure achieves a “carbon intensity” of 0.6 metric tons of CO<sub>2</sub> per ton of hot rolled strip. For bluemint® recycled – which according to the ecobalance consists of 100 percent scrap – TÜV SÜD certifies specific emissions of 0.75 metric tons of CO<sub>2</sub> per metric ton of hot strip.

Emissions that occur during further processing of bluemint® pure and bluemint® recycled are reported to the customer. For cold-rolled sheet, as used by Kaldewei, this means, for example, that each metric ton of finished product





bluemint® pure is leading us to low-carbon future:  
Kaldewei's Managing Director Franz Kaldewei (left) and Bernhard Osburg, CEO of thyssenkrupp Steel



## bluemint® Steel

has a carbon intensity of 0.71 tons of CO<sub>2</sub>. All purchasers of these new carbon intensity-reduced products are provided with a certificate that documents the carbon intensity and the amount of CO<sub>2</sub> saved in the case of bluemint® pure or the specific emissions in the case of bluemint® recycled.

bluemint® pure and bluemint® recycled represent the entire diversity of grades offered by thyssenkrupp Steel's portfolio. This means that customers can be confident in the knowledge they can continue to enjoy the same full range of steel grades as ever. In terms of material and processing properties, the two bluemint® Steel products are in no way inferior to the grades already on the market. Indeed, the very opposite is true: Their premium quality is complemented by significantly reduced carbon intensities. Bernhard Osburg: "bluemint® pure and bluemint® recycled deliver an immediate impact for the ecobalance of our customers." thyssenkrupp Steel calls it: High quality. Low carbon.

### bluemint® pure and bluemint® recycled

#### Benefits at a glance

- Around 1.5 metric tons (70 percent) lower CO<sub>2</sub> content (bluemint® pure)
- Around 1.35 metric tons (64 percent) lower CO<sub>2</sub> content (bluemint® recycled)
- CO<sub>2</sub> is reduced immediately on site in Duisburg
- Certificates for the respective product
- Primary steel, available in all grades
- Directly applicable to the Scope 3 emissions of customers

### Web

More about CO<sub>2</sub>-reduced and certified steels from thyssenkrupp Steel:  
[www.bluemint-steel.com](http://www.bluemint-steel.com)

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# thyssenkrupp Steel puts together **largest** **investment package** **in 20 years**

thyssenkrupp Steel is investing a sum in the high three-digit million range, setting the course for modernization of its production network. The goals: more capable products and increased flexibility.

Copy Jan Ritterbach



For more information on the investments at our Duisburg, Bochum, and Dortmund sites, please open the double page spread to the left and right. >



**T**he investments thyssenkrupp Steel has scheduled for the Duisburg, Bochum, and Dortmund sites will improve the quality of the product. A completely new line consisting of continuous casting lines, a hot strip mill, a double reversing mill and an

annealing-isolating line will further optimize manufacturing processes and make them even more homogeneous in the future. This applies in particular to the production of non grain oriented electrical steel and multiphase steels for the automotive industry and premium industrial applications as well as blackplate for the packaging industry. Customers' main benefit as a result of these upgrades will be having access to steels with improved geometrical and electromagnetic properties.

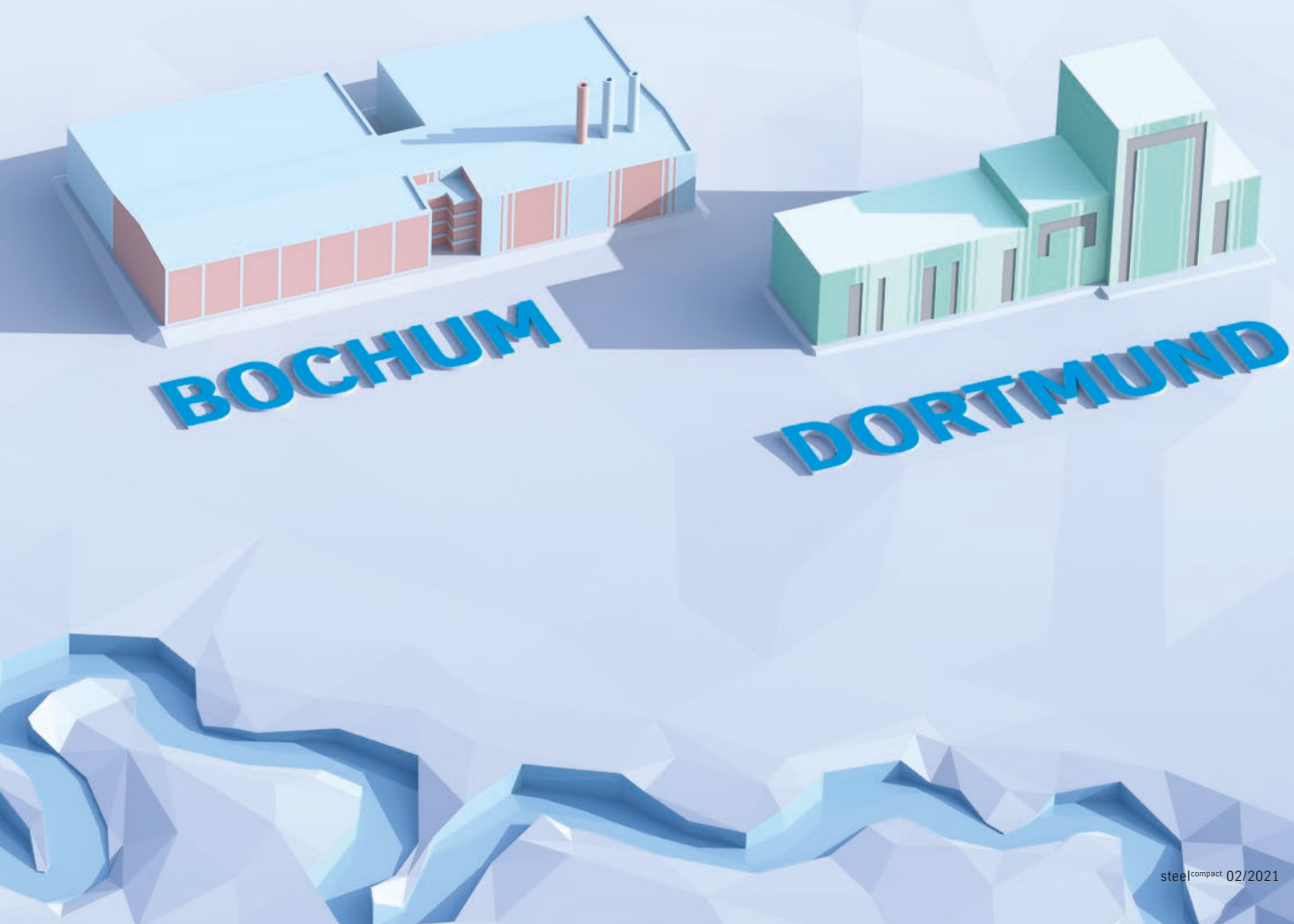
The plant expansion measures described above will also lead to a slightly increase in production capacity, which in turn will improve our ability to deliver the products as ordered and on time. In addition, the investment package underpins the company's image as a technology and quality leader and sustainably strengthens its position in European market. The upgrades are an integral part of the company's Steel Strategy 20–30, with its goal to focus more on profitable and growing markets that are opening up as a result of, for example, the energy

transition and the expansion of electromobility.

In this context, the focus is primarily on premium steel grades that are required for, among other things, efficient e-mobility solutions for motors and generators – such as powercore® Traction. Products from the premium surfaces segment, such as ZM Ecoprotect®, and dual-phase steels – which are required above all in the automotive industry for constructing lightweight crash-relevant structural components – continue to be of great importance.

### Tailored to market requirements

The new build and upgrade of production facilities will enable thyssenkrupp Steel to meet the changing needs of the market – such as the demand for tighter tolerances and thinner and wider products – in the best possible way. At the same time, the investment in the three sites will play a vital role in making steel production at these plants efficient and sustainable. As such, it is a key element in thyssenkrupp Steel's strategy for the future. The modernization measures are all set to be completed within the next four years.





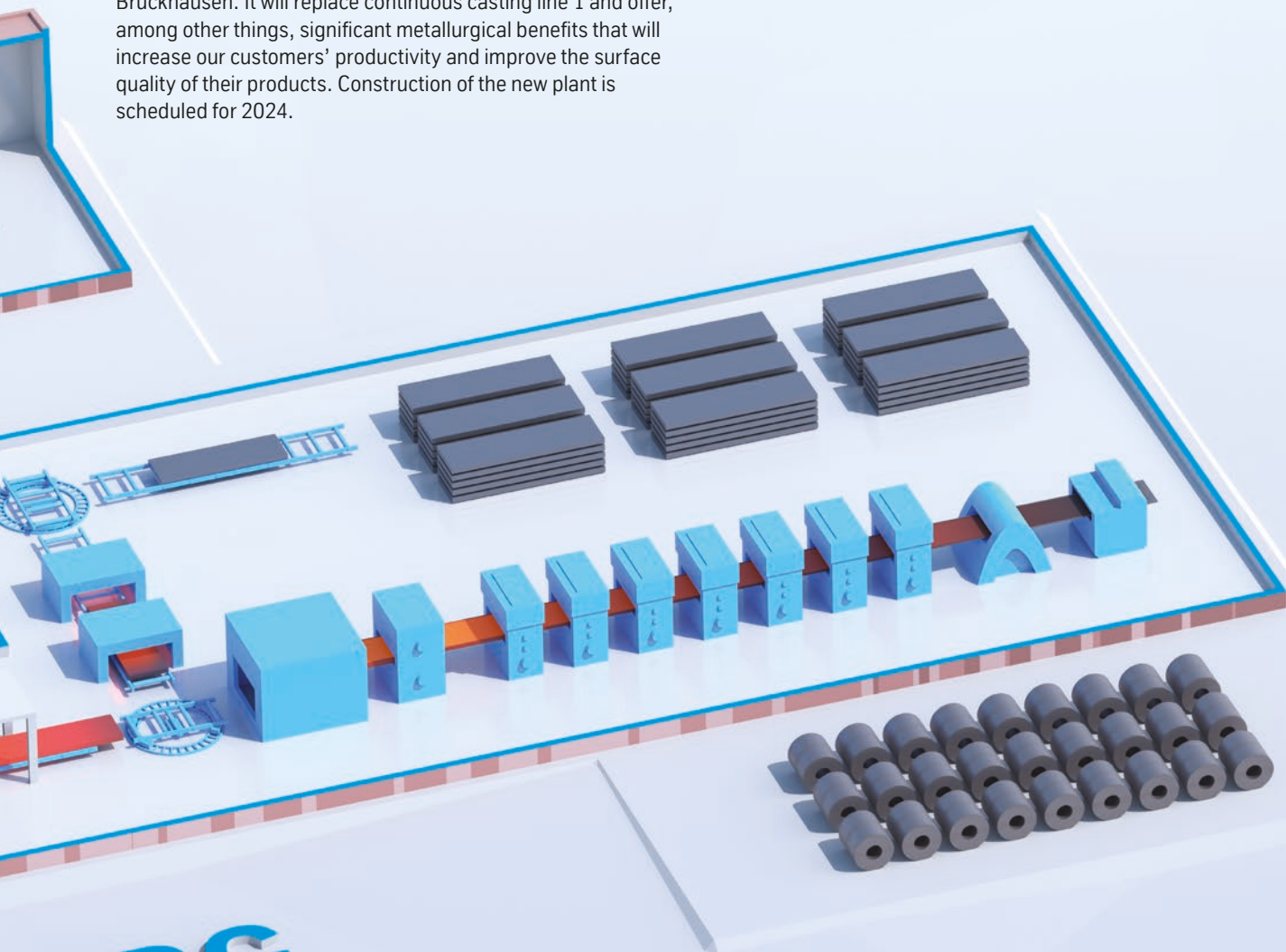
We are investing in our plant and equipment to make thyssenkrupp Steel's portfolio fit for the future and fit for our customers' needs."

**Dr. Arnd Köfler,**  
Chief Technology Officer  
thyssenkrupp Steel



### Continuous casting line 3

An all-new continuous casting line is planned for Duisburg-Bruckhausen. It will replace continuous casting line 1 and offer, among other things, significant metallurgical benefits that will increase our customers' productivity and improve the surface quality of their products. Construction of the new plant is scheduled for 2024.



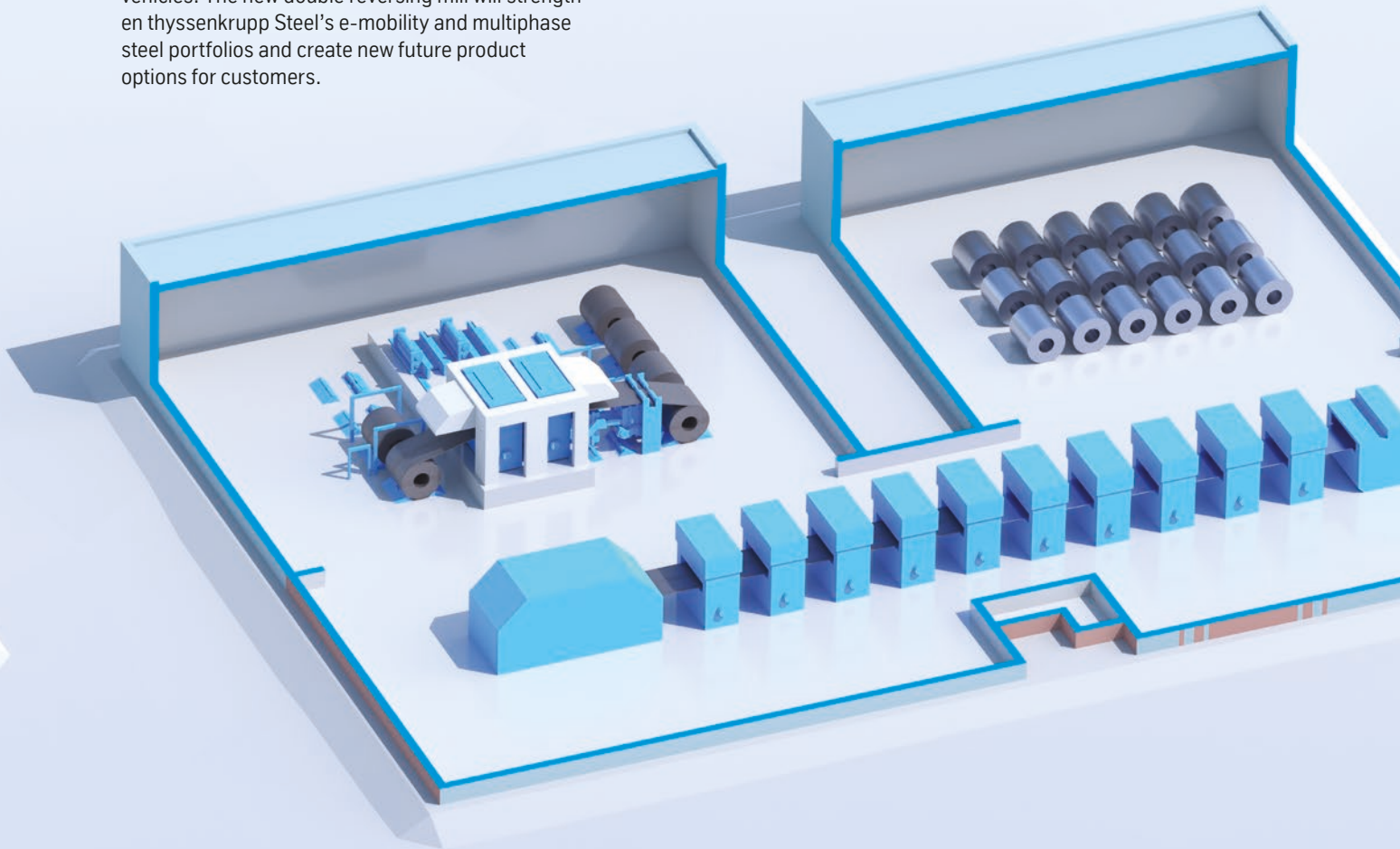
### Continuous casting line 4 & hot strip mill 4

At the Duisburg site, the existing casting rolling line will be converted into a continuous casting line with downstream hot strip mill. The project is the largest single construction measure of the investment package. Completion and integration are scheduled for 2024. This upgrade will increase the casting and rolling capacities of the plant and improve utilization of the upstream steel mill. In addition, process-optimized plant technology based on Industry 4.0 solutions will enable the portfolio of higher-strength steels and premium surfaces to be expanded. Customers can expect further quality improvements, more flexible slab production, and positive long-term effects on their security of supply and ability to meet deadlines.



## Double reversing mill

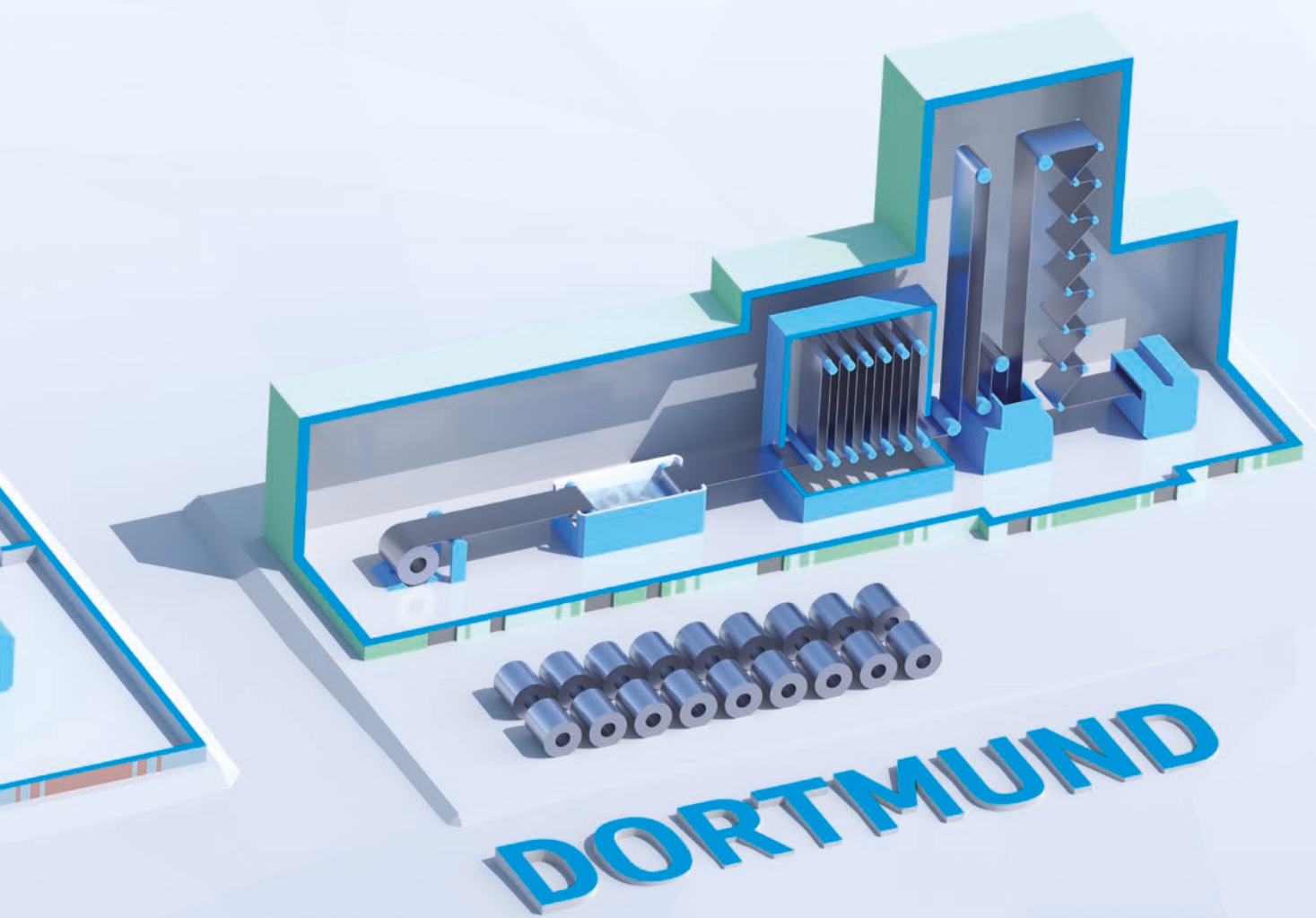
The cold strip mill on the Bochum site is to be equipped with a new double reversing mill. With its back and forth (reversing) action, the rolling mill will be able to roll particularly thin materials. These are used, for example, in the e-mobility segment and increase among other things the efficiency of electric vehicles. The new double reversing mill will strengthen thyssenkrupp Steel's e-mobility and multiphase steel portfolios and create new future product options for customers.



# BOCHUM

## Annealing and isolating line

The Bochum site will see the construction of a new annealing and isolating line. Together with the new double reversing mill, the site will be expanded to create a competence center for steels for electromobility. In particular, the site's capabilities in the production of non grain oriented electrical steel will be expanded to best meet the increasing demand for ever thinner and high-silicon materials for use in electric motors.



### Hot-dip coating line

The new hot-dip coating line FBA10 will be erected in Dortmund by 2022 and is scheduled to open as early as next spring. This move on the part of thyssenkrupp Steel is in response to market requirements, because demand for hot-dip galvanized products with premium surface qualities is growing continuously, especially in the automotive industry. The plant, which is around 350 meters long and up to 65 meters high, will be used to produce materials for vehicle interior parts and bodyside applications, using the established hot-dip galvanizing method and the highly innovative zinc-magnesium coating method. These methods not only save on material and cost but are also sustainable thanks to the reduced coating thickness. The automotive industry in particular will benefit from the expanded production capacities for hot-dip coated premium products from the new FBA10.

# From byproduct to valuable resource

Producing zero waste is an important environmental goal at thyssenkrupp Steel. A central component of this zero waste strategy is to utilize and recycle the byproducts of steel production. **Blast furnace and steel slags, sludges and dusts** are either used in-house or reprocessed so that they can be reused. This not only saves valuable resources but also significantly reduces climate-killing carbon emissions.

Copy Katja Marx



## Byproducts from picking,

including iron oxide, iron(II) sulfate and iron(II) chloride, are used in wastewater treatment, the pigment industry and for high-tech applications in magnet production and solar energy. Here, too, recycling helps reduce industrial waste.

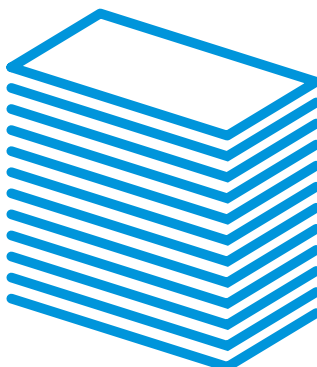


## Liquid blast furnace slag

is processed into ground granulated blast furnace slag (aka blast furnace sand) and used in the cement industry, where it replaces clinker burned from limestone, thus saving a much-used primary raw material. This reduces the use of CO<sub>2</sub>-emitting processes in the cement industry, resulting in a smaller carbon footprint: With blast furnace slag cement consisting of 60 percent blast furnace sand, CO<sub>2</sub> emissions are halved compared with classic Portland cement.

## Calcium carbonate (CaCO<sub>3</sub>)

is a fine white powder used in the paper industry as a pigment for coated papers. thyssenkrupp Steel is working on an innovative process to extract this high-purity material from steel slag and also investigating to what extent surplus CO<sub>2</sub> from the production process can be used for this – a further step on the way to the climate-neutral steel mill.



## Dusts, sludges and mill scale

are further byproducts of steel production. In some cases, they contain large amounts of iron and carbon. thyssenkrupp Steel recycles both back into production using what's known as the "Oxycup process". In this way, waste is avoided – contributing to the circular economy.





## Frost- and weather-resistant steel slags

(also: LD slags) are used, for example, in road construction or as high-grade chippings in asphalt wearing courses. In coastal protection, high-density LD slags are used to secure maritime structures. As fine-grained converter lime, they also play a role in the fertilizer industry: The slags are used to buffer soil acidity and to stabilize an adjusted pH value in the soils and thus contribute to sustainable preservation of soil fertility. They also supply crops with important nutrients such as silicon, magnesium and calcium. The diverse use of LD slags means that less natural stone is needed, which in turn means less need for energy-intensive mining.



By keeping the byproducts of the steel industry in the value chain, we are supporting the transformation of our company into a climate-neutral steelmaker and at the same time helping other industries reduce their own carbon footprint.”

**Christian Renner**, Head of Mill Byproducts and Waste Materials



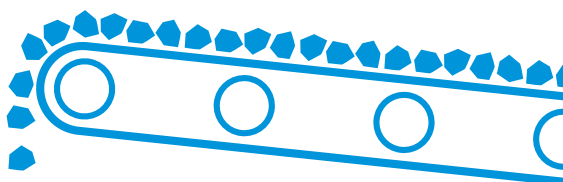
Photos: Nils Röscher, Olivier Gum and NTT from Noun Project

## What is “slag”?

Slag is the non-metallic melt left over after the extraction of metals from ores. Similar to lava, it consists mainly of calcium, silicon and magnesium oxides. The chemical composition of the slags can be influenced by the duration and method used to cool them.

The switch to hydrogen-based direct reduction processes will lead to the formation of new byproducts. In particular, the blast furnace slag so in demand in the cement industry can then be subsequently conditioned and matched even more precisely to the specific needs of the industry.

## In numbers



For every metric ton of pig iron, around 0.25 to 0.3 metric tons of **slag** arise; for every ton of crude steel, this figure is between 0.13 and 0.17 tons. Overall, Germany's steel industry produces around 13.5 million metric tons of slag annually. (Source: FEhS)

**97%** of blast furnace slags are processed into **blast furnace sand** – a fine-grained, vitreous granulate that can be used instead of limestone, for example, in the cement industry or as concrete aggregate.

If all the slag used between 1945 and 2018 was dumped on one huge pile, it would be 2,900 meters high and 600 meters in diameter – the size of Germany's highest mountain, the **Zugspitze**. (Source: FEhS)



## Web

For more info, go to:  
[www.thyssenkrupp-steel.com/slag-management](http://www.thyssenkrupp-steel.com/slag-management)

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# Smart aids for the production line

They count steps, set off alarms, measure temperature: **Smart sensors** dictate our daily work routine. These miniature measuring devices also perform important monitoring and control functions in thyssenkrupp Steel's plants.

Copy Katja Marx



**Small but powerful:** At thyssenkrupp Steel, miniature measuring devices perform important monitoring and control functions.

**T**he X-ray vision of the sensor doesn't miss even the smallest of bumps: It measures the thickness of the sheets as they whisk by with a degree of accuracy down to microns. It does this by evaluating how much radiation the material absorbs. This information is then combined with information on the composition of the alloy and analyzed – a smart contactless and delay-free method of detecting variations in thickness and maintaining tolerances.

The radiometric sensor is one of hundreds of thousands that ensure that all processes run smoothly in thyssenkrupp Steel's plants and that every sheet produced meets the customer's specific requirements. "In addition to dimensions, a lot of other data is collected, such as the color shades of paint or furnace temperatures. We're also particularly interested in the various mechanical properties, such as tensile strengths or yield strengths," explains Daniel Overlöper, who bundles in the Production team Analytics & Applications together with his colleagues the information from the sensors and collates it for structured analysis. Hot strip mill 2 in Duisburg alone processes more than 1.2 billion measurements every day, in addition to up to 16,500 metric tons of steel slabs.

## Networking plants

These small measuring devices have been in use for decades in the highly automated plants of the steel industry. They are robust and well adapted to their environment: for example, to enable them to pick up reliable data despite the extreme heat that prevails in the blast furnace or the fine mist in the hot strip cooling section. But are they smart? And fit to play a leading role in Industry 4.0? "Fit, yes, but smart in the true sense of the word, no", says Volker Lang, Head of Digital Transformation & Innovation at thyssenkrupp Steel. "But that doesn't mean we have to 'retool' everything. We can make our production plant smart by networking the sensor technology already installed." Digital solutions such as edge computing or IoT gateways can play a key role here (see info box).

The principle is similar to that used in the applications that almost 40 percent of the German population know from their own smart home: Users, for example, set a certain temperature and the smart radiators regulate themselves by receiving and evaluating measurement data. For this purpose, the heating system and the sensor must be networked by means of a control unit. The



Thanks to smart sensors, Daniel Overlöper is now able to determine material properties while production is in progress.

same principle holds true in the hot rolling mill, where constant measurement and control of the temperature is also of key importance because it has a crucial influence on the mechanical properties of the steel sheets produced.

### Controlling quality characteristics

Smart networking and the fact that industrial sensors have not only become significantly smaller but also cheaper have fundamentally changed the way data is handled. "As part of our digitalization measures, we have increased the number of sensors installed many times over," Daniel Overlöper tells us. "At the same time, powerful processors ensure that the huge volumes of data generated are processed in real time."

Take tensile strength as an example: Typically, this parameter, like other mechanical properties, is measured post-production by taking an actual physical sample of the material. In addition, the desired material properties can now also be monitored continuously during production with the aid of additional sensors. The data collected is fed into a mathematical model, together with other process parameters recorded in real time.

This allows results to be simulated in advance. "Although this is not yet a viable alternative to destructive sampling, it already helps the staff in the control room to better understand the quality-relevant parameters and control them accordingly."

### Avoiding disruptions

In conjunction with systematic data evaluation, sensors are also able to detect problems at an early stage and increase plant availability. "The technology has improved significantly in the area of vibration measurement, for example," notes Overlöper. "Today's sensors are smaller, more accurate, and cheaper. As a result, we have retrofitted them all over the place and are now able to detect very early on if something is not running smoothly."

### Measuring energy flows

Last but not least, thyssenkrupp Steel uses smart sensor technology to allow us to exploit resources more efficiently and therefore more sustainably. Gas and electricity flows are already being measured today. "It is technically feasible to refine this sensor technology so that we could also use it to record specific energy consumption levels in real time," explains Volker Lang. Digital networking is an important component of an efficient and sustainable steel production process, which can be traced transparently right back to the smelter.



**Believes in smart production:**  
thyssenkrupp Steel's Volker Lang.

## IT jargon decrypted

### Cloud computing

IT infrastructures are no longer kept on site on local computers, but are rented from a third-party provider. The data and services can be accessed via a network, such as the Internet.

### Edge computing

In contrast to cloud computing, edge computing refers to the decentralized processing of data immediately on site, that is, at the edge of a network. In industrial contexts, IoT gateways, acting as data transmitters, ensure that the huge volumes of data being generated can be processed quickly and used for real-time analyses.

### IIoT (Industrial Internet of Things)

In the Industrial Internet of Things, sensors, actuators, and control units are networked and can communicate with each other by exchanging data. This improves efficiency and increases the productivity of the plants.

### Smart sensors

A smart sensor is equipped with its own chip that enables it to communicate information autonomously. However, it can also send its real-time data to an IoT gateway (see above), which caches it, pre-structures it, and forwards it to the data pool for further processing.

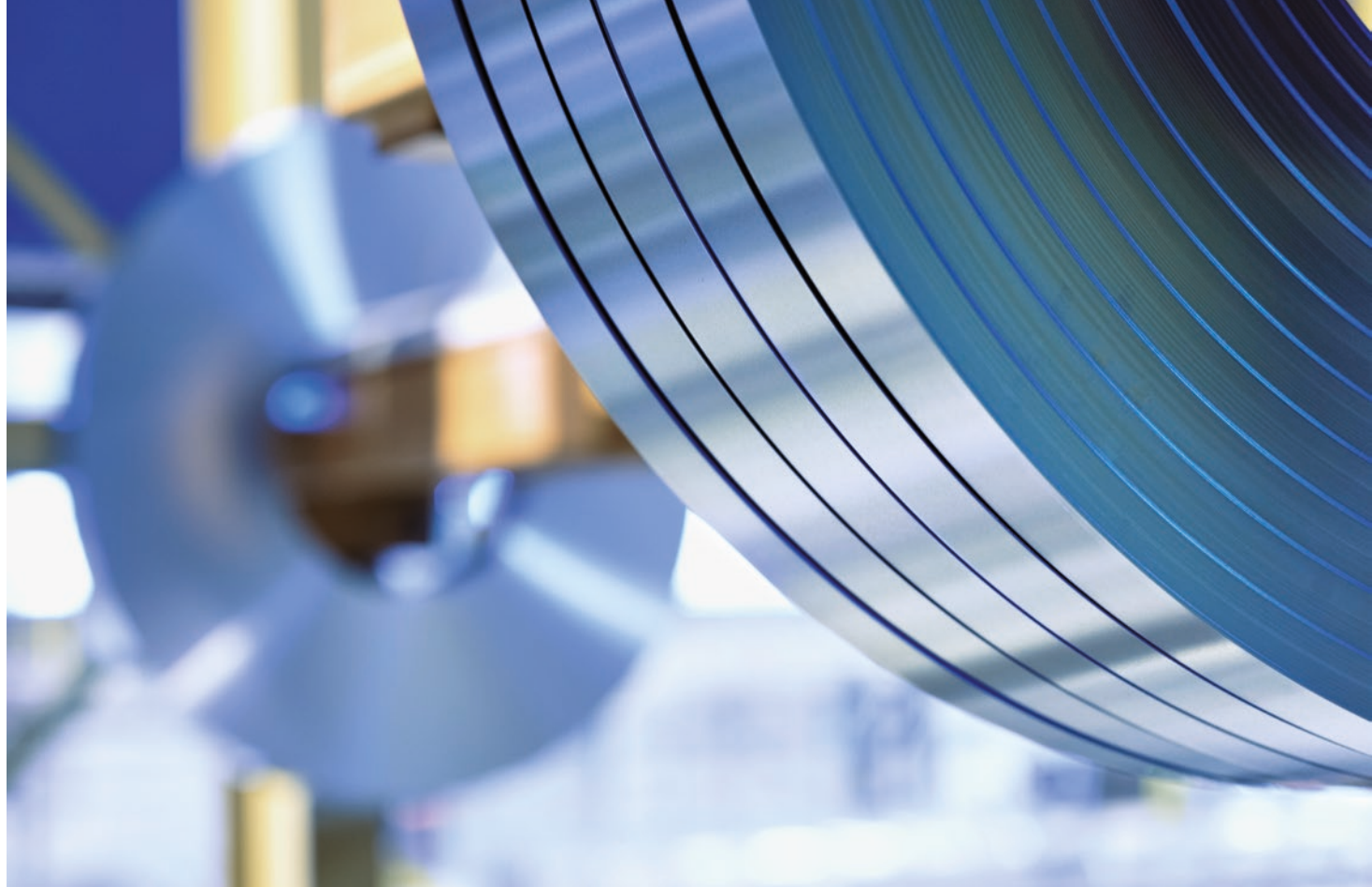
## Web

For more information on digital transformation, go to:  
[www.thyssenkrupp-steel.com/en/digitization](http://www.thyssenkrupp-steel.com/en/digitization)

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# “No electromobility without steel”

Steel is the most successful lightweight material today in the automotive industry. Nine out of ten vehicles in Europe are currently manufactured using a lightweight construction method in which steel is the dominant material. Steel also has ideal characteristics for electric vehicles and is used in drive motors as well as structural assemblies of contemporary EVs and plug-in hybrids.

**André Matusczyk**, CEO of thyssenkrupp Steel's Automotive business unit, talks with steel<sup>compact</sup> about the challenges surrounding e-mobility and the role of steel in the automotive future.

Interview conducted by: Editorial team of thyssenkrupp Steel

## Mr. Matusczyk, is it possible to build cars without using any steel at all?

No, impossible. Steel was, is and will always remain the 'material of mobility' and as such the core material in the automotive industry – even in the era of electromobility. That's because steel combines great potential for lightweight design with excellent cost effectiveness. Let me back this up with a few figures: The structure of a present-day electric car, such as VW's ID.4, weighs around 440 kilograms including the battery enclosure. The doors, hood and tailgate weigh another 120 kilos or so. Since aluminum offers no or only a minimal weight advantage in respect of the vehicle's body structure, steel is generally the material of choice. In many cases, this also applies to the add-on parts, i.e., doors, hood, and tailgate. In addition, all EV drive motors require a large amount of electrical steel. Depending on the model and whether it's a battery electric (BEV) or a plug-in hybrid vehicle (PHEV), between 20 and 90 kilos of electrical steel go into in each motor. There is no alternative to electrical steel for this specific purpose.

## But when it comes to the battery housing in electric cars – which is so important from the point of view of safety – manufacturers don't yet appear to be 100 percent convinced that steel is the right material for the job, do they?

There are, so to speak, historical reasons for this. The first electric vehicles built were actually standard conventional vehicles into which a heavy battery housing was retrofitted. It's due to this approach and the need to keep the

extra weight as low as possible that aluminum is still the go-to material for the battery housing, at least in Europe. That's a pity, because our research has shown that steel is only minimally heavier and clearly a much cheaper and more sustainable alternative. I'm sure we'll see more and more vehicles with battery housings made of steel or at least a blend of materials in upcoming generations. Because now it's all about properly integrating the function of the battery housing into the vehicle body. This means designing the battery housing as part of the side-impact protection structure from the word go.

### **One aspect of electric cars hotly discussed is that of fire safety. How do you rate steel in this context?**

High-performance batteries in cars demand extremely high standards in terms of safety. The individual battery cells must be protected against collision damage at all costs. Today's ultramodern steels offer unbelievably high degrees of strength and can take on an important protective role for the battery in locations such as the side sills, the B-pillars and in other crash-relevant positions. However, if a car does actually catch fire, steel has a real trump up its sleeve: Steel only melts at temperatures above 1,425°C. Aluminum alloys on the other hand liquefy at temperatures as low as 500°C. An appropriately dimensioned steel cover for the battery is therefore capable of withstanding those decisive few minutes longer to give the rescue services the time they need to get people out and save their lives.

### **A general question: What makes steel so special for the construction of both electric and conventional vehicles?**

Steel is available the whole world over and the manufacturing processes are not only safe, but have been tried and tested over decades. What's more, steel can be recycled without impacting its quality and cars made of steel can be easily repaired anywhere in the world – unlike car bodies made of fiber-reinforced plastics, for example. But most importantly, today's steels are extremely strong and offer great potential for lightweight design at an unrivalled cost/performance ratio. We call this “cost-effective lightweight design” – and steel is the absolute world-leader in this respect.

### **Which means lightweight design, safety, fire protection and cost-effectiveness can all be combined well with steel?**

Yes, and more than that. Electric cars are not an end in themselves – we want to prevent emissions and protect the environment. While they have no tailpipe or pump out toxic exhausts, their production, of course, still results in environment-polluting emissions. So it's important to take the environmental impact of production also into account when selecting materials.

And this is where new steel concepts for battery housings come off very well. Compared to the aluminum-based solutions deployed today, they produce up to 50 percent less climate-killing CO<sub>2</sub>, at significantly lower cost, with only a slight increase in weight.

### **That sounds good, but you still face a number of challenges in development moving forward. What will be the main focal points in the next few years?**

Even though we already have a wide range of highly suitable products, it's still possible we'll develop more new lightweight steels that will meet the needs of electromobility even better. This is what we're working on together with our customers. With electrical steel, too, there's still scope for further development and optimization.

But the key thing is if we really want to realize clean mobility, at some point steel production will also have to be carbon-neutral.

We have developed our own in-house technology to achieve this and have set ourselves very ambitious goals. By as early as 2030, we want to be able to supply the marketplace with a large share of carbon-optimized products and reduce our CO<sub>2</sub> emissions by 30 percent. And we want to be carbon-free by 2050 at the latest. This is not something that can be done just like that – the technology is extremely expensive and we're Germany and Europe and not an island. We can only survive long term in the global market if the same rules apply to all steel producers. And this level playing field can only be brought about by politicians. At the same time, it must be clear to everyone that environmental protection and zero emissions do not come free of charge. However, we are sure that there is a greater willingness to pay for vehicles that are completely CO<sub>2</sub>-free in production and use.

### **Mr. Matusczyk, many thanks for this interview!**



**André Matusczyk sees steel as the core material for car production – even in the era of electromobility.**

### **Web**

For more information on our portfolio for the automotive industry, go to: [www.thyssenkrupp-steel.com/en/automobil-trucks](http://www.thyssenkrupp-steel.com/en/automobil-trucks)

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# A perfect fit:

## Lightweight design meets safety and comfort

Vehicle seats must meet the highest demands in terms of economy, installation space, lightweight design, safety, and comfort. thyssenkrupp Steel has the **right steel** for the right bit of a front or rear seat.

Copy Gerd Krause/Jan Ritterbach

### Seat rails

precidur® HSM 700 HD  
perform® 550  
CP-K® 780Y980T  
standard thickness 1.5–2.0 mm

### Transverse tubes

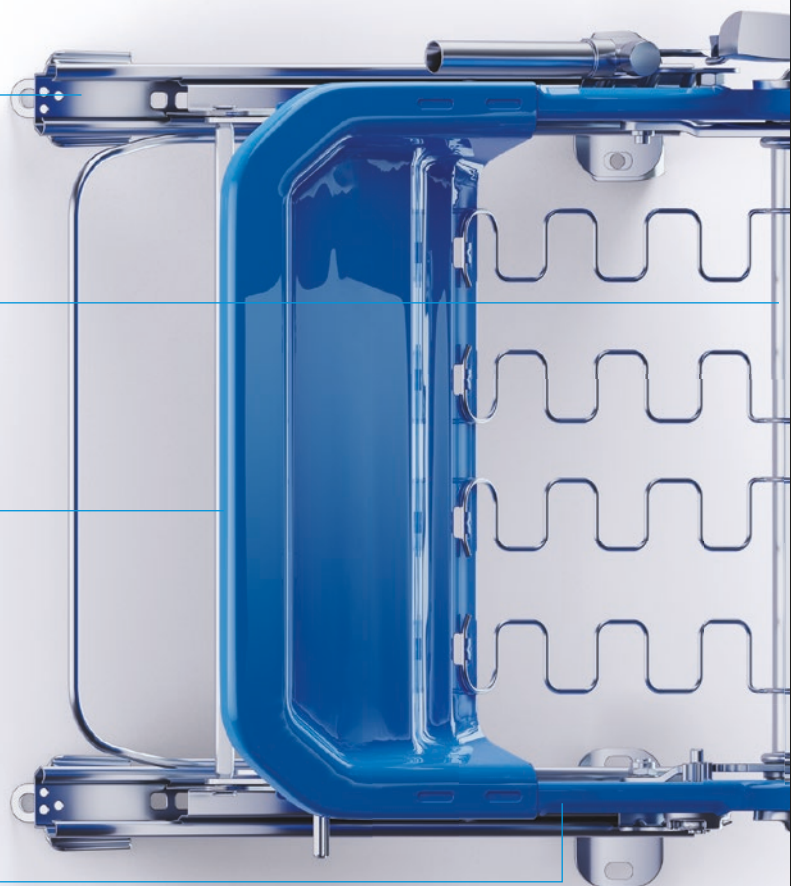
perform® 355  
DP-K® 440Y780T  
CP-K® 570Y780T  
standard thickness 2.0–2.5 mm

### Seat shell

MHZ® 340  
MHZ® 380  
DP-K® 290Y490T  
standard thickness 0.8 mm

### Frame side sections

perform® 500 HD  
CP-W® 660Y760T  
DP-K® 700Y980T  
standard thickness 1.6 mm



# A

modern car seat has to be a true all-rounder: it has to be lightweight yet crash-proof, take up very little installation space, be inexpensive to produce – and all of this, of course, without compromising comfort.

Steel helps to satisfy these diverse customer demands. Take the issue of weight, for example: Today, each seat weighs on average around 12.5 kilograms – and that's just the load-bearing steel structures.

Together, then, the front and rear seat structures of a car can easily weigh in at around 50 kilos. Cost-effective lightweight design using steel can have a noticeable positive impact here and help reduce weight by up to 15 percent – at no extra cost.

### Every single component is important

Seat rails, seatback, frame side sections and seat shell, seatback adjuster, height adjuster, articulated lever, fitting adapter, rear seat – seat structures are a complex system in which

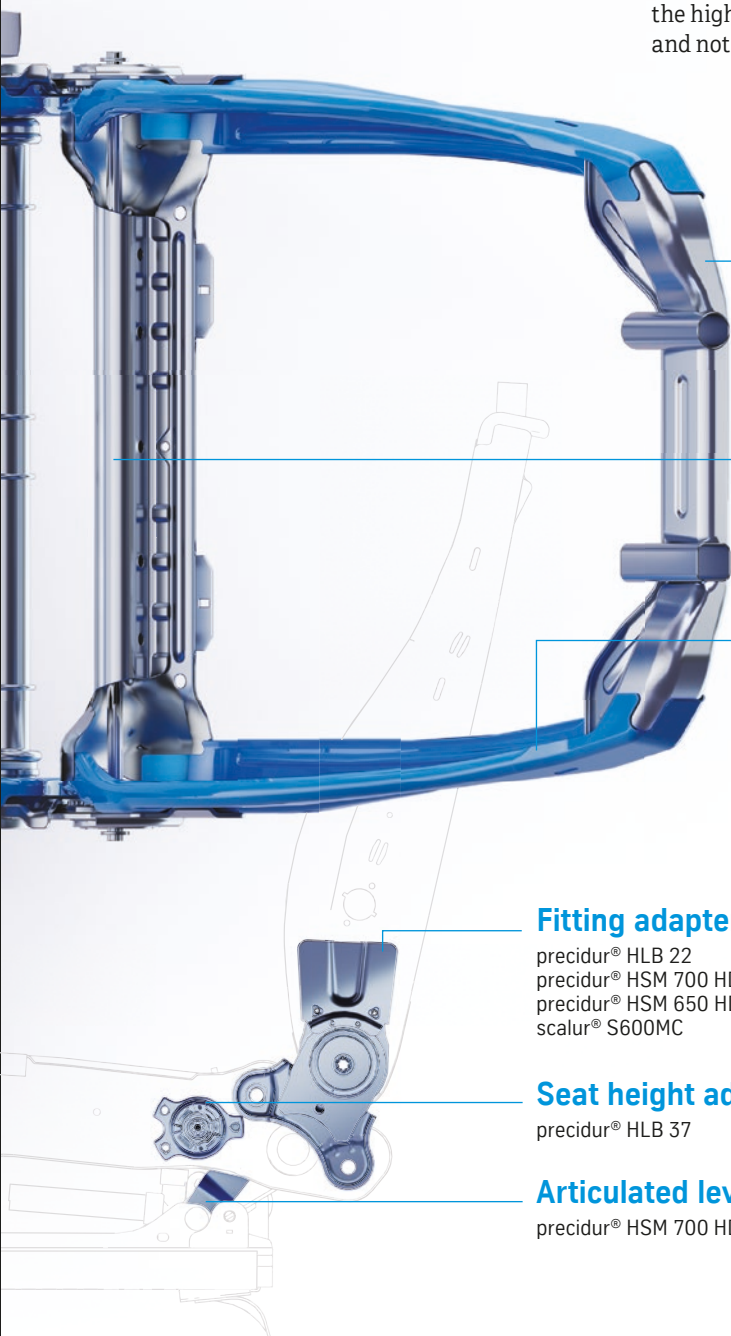


every single structural component is important. Take safety: The front seatback is stressed by the passenger in the event of a rear-end crash and by whatever's on the rear seat or possibly in the trunk in a frontal collision. Accordingly, different crash load cases must be considered for the seatback side panels, frame side sections, and seat shell. A task made for our robust DP-K® 440Y780T. With a rating of 780 MPa, this cold-rolled dual-phase steel is not only extremely strong but also easy to form, making it perfect for difficult-to-form structural components that are exposed in the event of a crash, such as the seatback side panel.

### Versatile solutions for the highest requirements

The more varied the requirements for seating structures and the more diverse customers' wishes and concepts are, the

more diverse are the potential solutions using innovative steel materials. Depending on the shape of the component in question, DP-K® 700Y980T or perform® 500 HD can be used, e.g., for the seat frame side panel (HD stands for "high ductility", making the steel particularly easy to form). The case-hardening and tempered steels and the micro-alloyed fine-grain structural steels of the precidur® family, for example, offer hot-rolled precision strip with extremely tight thickness and profile tolerances that is ideally suited to making functional components such as seatback adjusters. In addition, micro-alloyed, high-strength steels made from Hohenlimburg precision steel in particular are ideal for classic cold-rolling processes and seat rail applications. Finally, the cold-rolled complex-phase steel CP-K® 780Y980T is another high-performance material in the 1,000 MPa strength class that features excellent forming properties and meets the highest thickness tolerance requirements – and not only for seat rails.



#### Upper seatback crossbar

MHZ® 420  
standard thickness 0.8–1.1 mm

#### Lower seatback crossbar

DP-K® 440Y780T  
MHZ® 420  
standard thickness 0.8–1.0 mm

#### Seatback side sections

DP-K® 440Y780T  
DP-K® 590Y980T  
DP-K® 700Y980T  
standard thickness 0.8–1.1 mm

#### Fitting adapter

precidur® HLB 22  
precidur® HSM 700 HD  
precidur® HSM 650 HD  
scalur® S600MC

#### Seat height adjuster

precidur® HLB 37

#### Articulated lever

precidur® HSM 700 HD

### Web

For more info on the topic of bodywork and seats, go to:  
[www.thyssenkrupp-steel.com/lightweight-steel-seat-structures](http://www.thyssenkrupp-steel.com/lightweight-steel-seat-structures)

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# Electrical steel driving energy transition

A new implementing regulation introduced under EU Ecodesign Directive Tier 2 has greatly tightened the technical requirements applicable to transformers. Since too much energy has been lost in the past when switching voltage levels, only highly efficient models will be permitted in future. The key material when designing state-of-the-art transformers is **grain oriented electrical steel** – more precisely, top-grade powercore® products from thyssenkrupp Electrical Steel.

Copy Jan Ritterbach

**E**urope's energy network is undergoing a transformation. Step by step, the centralized electricity highways, which for the most part are fed by large fossil-fuel power plants, are being supplemented by a growing, highly branched network of decentralized generating plants, such as locally operated wind turbines, photovoltaic panels, or combined heat and power (CHP) stations. These not only generate electricity, but also feed it into the power grid. This has consequences for the infrastructure: "When the locations where power is generated and where it is consumed change, we need to build more power lines," says Dr. Matthias Schick from thyssenkrupp Electrical Steel's Technical Customer Support.

In addition to these additional lines, the grid also requires more distribution transformers, because without them, the electricity transported over the high-voltage lines will not be able to be transformed into the 230 volt alternating current we require in our homes. The problem is, many of these transformers in the European grid are not efficient enough. Many experts are of the opinion that too much energy is lost in the transforming process. As a result, the EU has laid down significantly stricter specifications in an amendment to the regulation on ecodesign requirements for power transformers. Every transformer delivered



Dr. Matthias Schick (left) and Head of Sales Marcel Hilgers conducting a material inspection.

Coils at the Gelsenkirchen plant waiting for further processing.





after July 1, 2021 must be at least 98 percent efficient under full load. “By enforcing these more stringent requirements, the EU hopes to save around 16 terawatt hours (TWh) per year by 2030. This corresponds to around half of Denmark’s total electricity consumption,” explains Electrical Steel’s Head of Sales, Marcel Hilgers.

### Top grades open up top opportunities

Dr. Markus Weber, CTO of the thyssenkrupp Electrical Steel Group, explains that the key to achieving greater energy efficiency is grain oriented electrical steel, which is used to build transformer cores. Grain oriented electrical steel is characterized by grains of up to several centimeters that are oriented along the rolling direction and which are therefore particularly easy to magnetize in this direction. The efficiency specifications, together with the end customers’ restrictions on the dimensions of the transformers, are forcing transformer manufacturers to use top grades. This ultra-thin and highly alloyed steel demonstrates its strengths wherever electrical energy is transformed from one voltage to another with low losses at high induction levels. “The production of these grades is technically extremely demanding and demands a great deal of experience,” Schick stresses. The permitted tolerances with respect to the chemical composition of these steels are extremely tight. What’s more, the process parameters must be maintained with extreme precision during the production process to ensure the grades produced really are of top quality. The material itself goes through several rolling and annealing processes. Only after a number of



Sees grain oriented electrical steel as a key to greater efficiency: Dr. Markus Weber, CTO of the thyssenkrupp Electrical Steel Group.

weeks, once the final annealing stage has been run through and the material has been coated, do we discover whether we have realized the desired texture, i.e., orientation, of the grains.

thyssenkrupp Electrical Steel plays a pioneering role in this complex production process as the company has been producing grain oriented electrical steel since the 1950s. In Europe, Electrical Steel – with its two production plants in Gelsenkirchen/Germany and Isbergues/France – is in fact the only supplier currently capable of producing the top grades urgently required to upgrade the transformer infrastructure. This is a unique selling point that will open up great opportunities in the years to come as demand for top grades is currently soaring due to the energy transition. One example: While our product powercore® H 075-23, with a maximum permissible core loss of 0.75 W/kg, was practically unknown five years ago, it is now a standard grade for many distribution transformer manufacturers.

### Grid expansion boosts demand

The new EU regulations are fueling this development. By promoting the message of there being “no need to generate power saved by transformers,” the new Ecodesign Directive Tier 2 is driving the procurement and installation of more high-quality grid equipment. In addition, since measures need to be taken to stabilize the grid due to the fact the supply of green electricity isn’t always constant, demand for grain oriented electrical steel is growing even more. This is because the reactors (aka phase shifters) used for grid stabilization are also made of this much sought-after material. “Based on the current situation, we expect a significant surge in demand in the coming years,” says Hilgers. This will be to the benefit not only of thyssenkrupp Electrical Steel, but also the environment. If the EU’s plans come to fruition, more energy-efficient transformers alone will help cut annual CO<sub>2</sub> emissions by an average of 3.7 million metric tons by 2030. And this only describes the situation in the EU: the demand for top grades is also increasing globally due to the growing number of countries introducing ever stricter minimum efficiency requirements. thyssenkrupp Electrical Steel is responding to this surge in demand not only with supplies from our European production facilities but also from our Indian plant in Nashik, which likewise produces top grades.

### Web

For more info, go to:  
[www.thyssenkrupp-steel.com/en/electricalsteel](http://www.thyssenkrupp-steel.com/en/electricalsteel)

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# Popular patina

German homeowners have been investing a great deal of time, money, and creativity in their gardens during the coronavirus pandemic. And one material – actually more at home in the construction and industrial sectors – is becoming increasingly popular: rust-brown **patinax®** from thyssenkrupp Steel.

Copy Jan Ritterbach



Eye-catcher for gardening enthusiasts: patinax® offers stimulating and vibrant contrasts in natural environments.



The newfound popularity of patinax® is rooted – in the truest sense of the word – between flower beds and trees. Whether it's in planters, borders, retaining walls, or lawn edging – in 2021 this weathering structural steel with its characteristic patina has become a feature of many modern gardens. And if you ask why it has become so popular, you will frequently hear the same word: vibrancy.

Indeed, after just two to three weeks, this rustic material starts to take on a life of its own. On delivery, patinax® generally has a flawless steel-gray surface. But unlike untreated steel, patinax® does not corrode gradually when exposed to the elements. After two to three weeks of contact with moisture, cold, or heat, the material changes its structure and appearance: a rust-brown patina forms on its surfaces with a highly individual appearance. “The same material from the same production batch can take on a completely different look depending on the outdoor conditions,” explains Roger Hannig, Technical Customer Support in the Industry business unit.

How the individual coloring will end up is hard to predict. But lower temperatures and high humidity are much more likely to produce a darker tone than heat and dry air. “In all cases patinax® develops warm earth tones that blend in perfectly with the natural environment of a garden,” says Hannig. In just the same way as the colors of a garden change over the course of the year, patinax® materials continuously take on new hues. It takes years before the coat of rust on the steel is fully developed.

## Ecological material offering natural protection

The reaction on the surface of the material is not just a visual phenomenon. On the contrary, it is of great importance for the durability and stability of the steel. Because when it comes to resisting the elements, a protective outer skin of rust is very useful. patinax® is a special alloy containing copper, chromium, nickel, and phosphorus to create a natural, firmly adhering barrier layer. Andreas Dietrich, also part of the





Of architectural value: patinax® lends itself to the construction of spectacular facades – and is extremely robust and weatherproof.

Technical Customer Support team in the Industry business unit, adds: “This outer layer, which is virtually impermeable to oxygen, makes the material significantly more resistant to atmospheric corrosion than unalloyed structural steels.”

With patinax® 355P and patinax® 355 – the official grade names – thyssenkrupp Steel currently offers do-it-yourself enthusiasts, designers, architects, and building owners two steels with higher-than-average durability.

### Product info – patinax®

**patinax® 355:**  
maximum thickness 13 millimeters; as formable as conventional structural steel; min. yield strength 355 MPa.

**patinax® 355P:**  
maximum thickness 12 millimeters; increased phosphorus content makes it even more resistant to corrosion; min. yield strength 355 MPa.

They do not need to be painted and are fully recyclable. patinax® can therefore be classified as an ecological material – another reason why it is ideal for ornamental objects of all kinds and is also growing in importance as a material for sustainable construction projects.

### A hard shell for tough applications

Aside from green and landscaped spaces, patinax® has been used for many years for high-end building facades and in industrial applications. This structural steel from thyssenkrupp Steel is also suitable for demanding, high-quality support structures. Bridges, for example, require very strong and durable construction materials. patinax® is supplied with a yield strength of at least 355 MPa, allowing both intricate and highly robust architectural designs. Its high corrosion resistance also makes it the ideal material for containers, mine cars, and tanks. The advantage: Damage to the painted surface caused by the cargo more or less repairs itself. If scratches or cracks occur, the protective patina forms and prevents further corrosion processes.

Dietrich: “In harsh outdoor environments in particular, patinax® can significantly reduce coating and maintenance costs.” True to the motto “the exception proves the rule”, it should be noted that in individual cases very specific climatic conditions and structural details can impact the corrosion behavior of the material. In particularly severe atmospheres, permanent humidity, or applications in marine environments, additional surface protection may be recommendable.

But in general, the bottom line is: Whether it’s used as a highly weather-resistant steel for gardens or as a special material for exposed steel structures: patinax® from thyssenkrupp Steel makes structures lighter, more durable and more economical. For companies, building owners – and people with green fingers.

Roger Hannig (left) and Andreas Dietrich are the patinax® experts at thyssenkrupp Steel.



### Web

You can find everything you could want to know about corrosion-resistant patinax® and its applications on the web at: [www.thyssenkrupp-steel.com/patinax-in-the-garden](http://www.thyssenkrupp-steel.com/patinax-in-the-garden)

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# Steel completes the loop

Steel is an important factor for a climate-neutral Europe. It is the most widely used and most recycled industrial material around. And the great thing is – the more often steel is recycled, the smaller its carbon footprint. An example of this is **tinplate**, which is used among other things as food and pet food packaging.

Copy Jan Ritterbach

**P**lastic waste in the oceans, major problems with waste disposal and the general finite nature of natural resources: pressing challenges that make it clear why the circular economy is becoming increasingly important for modern society.

That's why the European Union's Green Deal includes a new Circular Economy Action Plan. It aims to use products and materials, energy and resources, as well as waste and residual materials sustainably and for as long as possible, for example, through reuse and recycling. One

material particularly suitable for this is tinplate. But despite its excellent properties, not all consumers are aware of its green qualities.

## Awareness of recyclability still too low

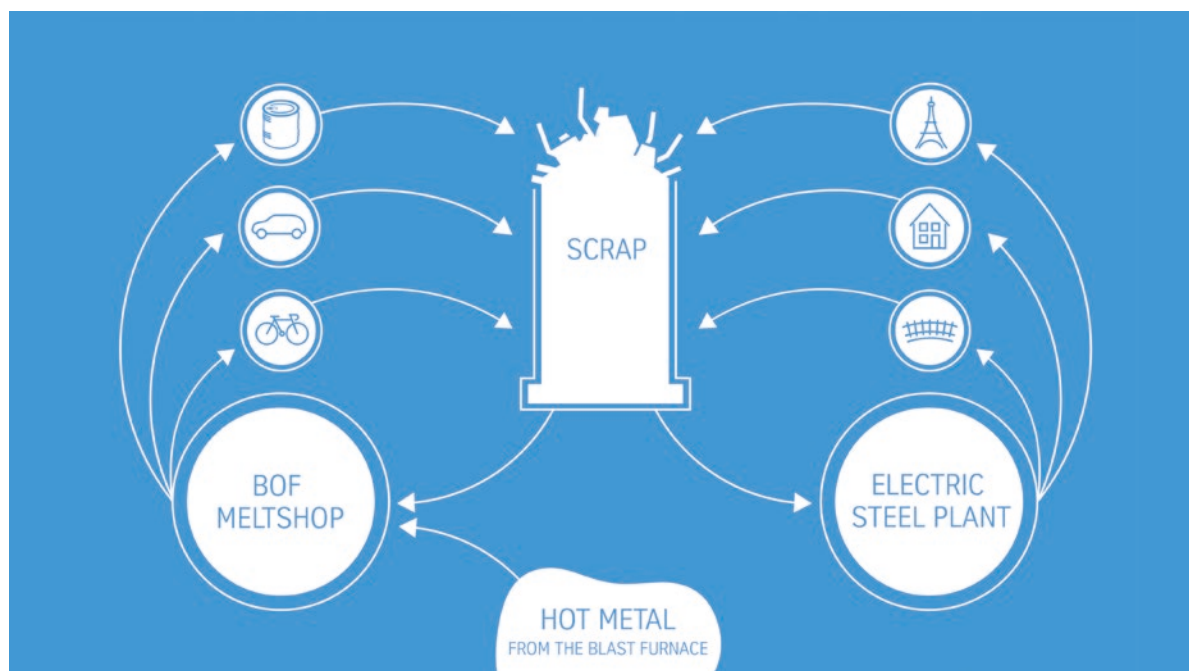
"Unfortunately, consumer awareness of the recyclability and recycling of tinplate is still low," explains Carmen Tschage, Head of Communications and Market Development at thyssenkrupp Rasselstein. "This was shown by a representative survey carried out for us in Germany by the market research agency YouGov. For example, consumers estimate that the recycling rate for tinplate is only 55 percent, whereas the actual figure is much higher at 91 percent." The underestimated material therefore has a far greater potential than many believe - and it can make a valuable contribution to the more sustainable lifestyle that more and more people want. "Today, consumers see that rising mountains

## Consumer infos on the net

In future, thyssenkrupp Rasselstein will be using a new internet platform and Instagram to provide consumers with more information about the sustainable benefits of tinplate. At [weissblech-kommt-weiter.de](https://www.weissblech-kommt-weiter.de) (tinplate goes on and on and ...) and on an Instagram channel of the same name, consumers will be able to discover everything they should know about the multi-recycling of packaging steel, its production and the closed material cycle. These channels will also cover the in topic of "green steel".







This simplified diagram of the steel cycle shows how well materials such as tinplate can be recycled.

of plastic waste and huge garbage patches in the oceans are a real threat to the environment and ultimately to us humans, and they want to change their behavior.”

Tinplate can help: As a packaging material, tinplate scores not only for its good recycling properties but also for its well-functioning return systems. If, instead of being incinerated after use or dumped in landfills outside Europe, packaging is fed back into the manufacturing process, valuable resources are saved. Packaging steel plays a major role in our everyday lives – for example in the form of food, pet food and drinks cans, packaging for chemical/technical products, spray cans for aerosols, or jar lids and bottle tops – making individual consumers a powerful lever in the circular economy.

And by choosing tinplate packaging, they can support multi-recycling and the closed material cycle with a flick of the wrist – by throwing tinplate packaging into the recycling bin after use.

### Lost none of its topicality: the “I was a can” campaign

As long ago as the mid-1980s, the “I was a can” campaign run by the Informationszentrum Weißblech (Tinplate Information Center, IZW) attracted a great deal of attention. Its aim was to show the German population that tinplate’s remarkable recyclability makes it a very environment-friendly resource. Until then, packaging was generally regarded as a symbol of the throwaway society.

Under the catchphrase “I was a can”, this advertising campaign presented images of “talking” objects that at first glance had nothing in common with cans. The concepts employed encouraged people to actually think about the topic and made it very clear that what they had always considered “spent”, “chuckable” tinplate can in fact be reused to make a great many useful new things – and in a sustainable and eco-friendly way.



### Web

Link to our internet platform (Only in German):  
[www.weissblech-kommt-weiter.de](http://www.weissblech-kommt-weiter.de)

Link to our Instagram channel (Only in German):  
[www.instagram.com/weissblech\\_kommt\\_weiter](https://www.instagram.com/weissblech_kommt_weiter)

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# A liaison of wood and steel

At Girondor they know all about fine barrique wines. The French company manufactures barrel hoops – the **sturdy steel bands** that hold together traditionally made oak barrels. The starting materials for this centuries-old craft are supplied by thyssenkrupp Steel through a distribution partnership with metal goods specialists Wieland France.

Copy Katja Marx

**T**here are around ten kilograms of steel in a traditional wine barrel, or to be more accurate in the barrel hoops that hold the heavy oak staves together and give the barrel its distinctive shape. Barrel making today is still carried out in the traditional way: The barrel maker or cooper first arranges the seasoned wooden staves to form an open-bottom cone.

A fire is lit in the middle to make the staves pliable and release the typical toasted aromas of the barrel. As the staves bend they are gradually pressed together by a steel rope – a hot and arduous job.

## Narrow strip from the Sauerland

Girondor, a small company based in the French town of Chalon-sur-Saône, is a specialist in the niche market of barrel hoop production. Steel

**Narrow strip from thyssenkrupp Steel helps preserve old winemaking traditions and gives the barrels their stability.**





hoops for various barrel sizes are manufactured on three production lines and supplied to barrel makers around the world. The starting material comes from Finnentrop in the Sauerland region of Germany, where thyssenkrupp Steel operates a continuous galvanizing line for hot-rolled narrow strip.

For this, the steel is first cut to size and pre-treated. Several strips are then guided through the galvanizing line in parallel. “This process ensures the material is also galvanized along the edges. That differentiates it from hot-dip coated slit strip and is a particular advantage when outstanding all-round corrosion protection is called for,” says Burkhard Wappler, Key Account Manager in the Industry business unit. Long-lasting protection against rust is one of the most important requirements for the storage and transportation of the heavy barrels, which is why the zinc coating for barrel hoops is twice as thick as conventional coatings.

### A barrel hoop must shine

The second quality characteristic is appearance: Barrel hoops should display an even metallic shine. That’s why the narrow strip is chemically passivated after cooling. This post-treatment protects the material against moisture and preserves its typical metallic appearance. To ensure the surface remains perfectly even during further processing into hoops, hot-dip galvanized narrow strip from thyssenkrupp Steel also has good forming properties.

“A key criterion for this product is an even, high-quality surface,” says Benoît Boubée, Manager Vineyard Products at Wieland France. The company is a long-standing business partner of thyssenkrupp Steel and supplies French barrel hoop manufacturers like Girondor with the required starting materials on a flexible basis. “Thanks to our close and long-standing cooperation with thyssenkrupp Steel and our combined expertise, we can guarantee that the materials our customers order will meet their high requirements.”

### Crafts meet steelmaker

Girondor processes several thousand metric tons of steel per year, making it one of the biggest suppliers to the niche cooperage market. But compared with thyssenkrupp Steel’s industrial customers, the amount of hot-dip galvanized narrow strip the company processes is relatively small. “In addition, demand depends on the quantity and quality of the annual grape harvest,” says Gilles Biré, responsible for Industrial Products at thyssenkrupp Steel France. “For us alone it would be difficult to meet the need for small batches on a flexible basis. But together with our cooperation partner Wieland France it’s no problem.”



The narrow strip galvanizing line is the second-biggest line at thyssenkrupp's Finnentrop site.

A manufacturer of a wide range of metal goods, Wieland France combines orders from French wine barrel specialists and keeps corresponding volumes of starting materials in stock. In turn thyssenkrupp Steel holds material for Wieland France in stock so as to be able to respond to fluctuating demand at short notice and with fast delivery times.

“Precisely because this is such a small market segment, good service and dependable quality play an important role,” says Burkhard Wappler. “We are pleased and proud to be able to meet the high expectations of the winemaking trade with our narrow strip and help uphold an age-old tradition.”

### Application areas

Corrosion-resistant hot-dip galvanized narrow strip is also widely used in the construction industry, such as for:

— Guide rails for garage doors

— Grounding straps

— Guttering brackets

### Web

For more info, go to:  
[www.thyssenkrupp-steel.com/barrel-hoops](http://www.thyssenkrupp-steel.com/barrel-hoops)

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# Colors for facades

With pladur® ReflectionsOne, industrial buildings blend harmoniously into their surroundings. One project where this colorfast and corrosion-resistant facade solution is being used in thyssenkrupp Steel's own new **FBA10** hot-dip galvanizing line currently being built on the Westfalenhütte site in Dortmund.

Copy Katja Marx

**A** showcase project is taking shape: The 350 meter long and up to 65 meter high FBA10 is scheduled for completion and start of production by spring 2022. As a building block in thyssenkrupp Steel's strategic realignment, the high-tech plant will serve the growing demand for high-quality hot-dip galvanized steel. The high-quality steel is also being used in the facade of the building itself: The facade panels will be reliably protected from corrosion by the innovative zinc-magnesium-based hot-dip coating ZM Ecoprotect®, which

Georg Wurzer values the customizability pladur® offers for facade designs.



features a thinner zinc layer compared with conventional hot-dip galvanizing.

## Harmonious color scheme

The appearance of the building envelope deserves special attention: Its green and blue basic color scheme matches the built environment, especially that of the neighboring sister plant FBA8. The shades of green harmoniously integrate the building into the natural surroundings of the site, while the two towers of the main hall nave rise up to the sky in matching blue tones, visible from afar. The south-west view is dominated by the long and uniform structure of the warehouse. The combination of fresh tones lends the building a vivid and modern character.



**pladur® not only looks good but has very good processing properties and is at the same time highly resistant to corrosion and UV radiation.**



“The friendly and attractive appearance of the plant underlines thyssenkrupp Steel’s image and is a positive design element in its immediate surroundings. An environmentally compatible presence is thus created even for a large-scale plant of this size,” explains Thorsten Holtermann, responsible at Corporate Architecture for the in-house color design of the company.

### Reliable partnership

Leading partner in the project is Wurzer Profiliertechnik GmbH, which fabricates the organic-coated flat steel produced in Kreutztal-Eichen into liner trays and trapezoidal profiles with material thicknesses of between 0.88 and 1.0 millimeters. With 90 employees, the Bavarian family business specializes in roof drainage systems, corrugated, trapezoidal, and liner tray profiles as well as flashings. Wurzer attaches great importance to custom design

### pladur® ReflectionsOne

The pladur® ReflectionsOne collection, with more than 100 coordinated color shades, has been created specially to enhance the design of buildings. This especially developed sophisticated design collection offers gray shades with a puristic and stabilizing effect, relaxing and cheerful green tones, warm and comforting earthy tones, and many other nuances.

To ensure that the multifaceted colors of the ReflectionsOne collection retain their radiance over many years, particular emphasis was placed during development on color and gloss stability. Complementing the highest-quality base coat, the premium pigments used ensure excellent covering power. This combination reduces UV absorption to a minimum.

– one of the reasons the company likes to use pladur® for facades in the commercial sector. “pladur® has very good processing properties, is cost-effective and at the same time particularly resistant to corrosion and UV radiation,” says company owner Georg Wurzer.

This, and a decades-long partnership with thyssenkrupp Steel, also tipped the scales in favor of pladur® ReflectionsOne for the cladding of the profile specialist’s own new warehouse and production building. “Colored facades need to be well planned so that they blend perfectly into the surroundings. So we were glad to be able to call on the steel and coil coating expertise, color advice, and, of course, technical advice of thyssenkrupp Steel,” says Georg Wurzer.

thyssenkrupp Steel, in turn, is full of praise for the flexible and reliable production of the facade profiles. The responsible sales manager Axel Pohl: “The completion of FBA10 has been delayed among other things by bomb discoveries during the earthworks and the COVID-19 pandemic. This has represented an organizational challenge for all the companies involved in the project. At times like this, it’s good to have a partner like Wurzer Profiliertechnik capable of dealing with every eventuality in a calm and customer-focused way.”

### Certified sustainability

The environmental compatibility of the materials used is becoming increasingly important in commercial construction. “Sustainable building certification, for example LEED or DGNB, is on the rise. Certification increases the value of a property,” says Axel Pohl. “Steel is an excellent material in this respect. Not only is it durable, it can also be recycled without any loss of quality, which has a positive effect on the carbon footprint.” The environmental performance of pladur® is recorded in an Environmental Product Declaration (EPD). These declarations are issued in Germany by the Institute for Building and Environment (IBU) and certified by independent agencies.

### Web

For more info, go to:  
[www.thyssenkrupp-steel.com/industrial-facade-design](http://www.thyssenkrupp-steel.com/industrial-facade-design)

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# Steel's local heroes

The association **Förderverein Hüttenhelden e.V.** supports thyssenkrupp Steel employees who volunteer in a wide variety of roles to help people in their local communities.

Copy Katja Marx

**J**ürgen Schaab is a steelworker at the BOF meltshop in Duisburg. Most days after work he can be found just 2 kilometers away at the sports and social club Sport- und Freizeitverein Budokan e.V. While the name might sound

old-fashioned, the club's work is anything but: As well as martial arts and fitness workouts, training focuses on helping people understand what buzzwords such as "integration" and "diversity" mean in everyday life.

Budokan attracts youngsters from the working-class district of Duisburg-Beeck and the surrounding area. People with German, Syrian and Bulgarian passports – and for the past few years wheelchair users from the nearby Christy Brown special school as well.

A lighthouse project that was never planned that way. "In the 1990s, there weren't many opportunities in Duisburg for me to try an emulate by idol Bruce Lee," says Jürgen Schaab. "So my best friend Halit and I started up our own martial arts group. And suddenly we were surrounded by people who wanted to join in." Later, members started to bring their children along, too, and it's the kids who are now in the majority. The key to success? Enjoying doing

something together – and laying down clear rules. "Anyone who misbehaves is thrown out," says the skilled steelworker, laughing. You don't doubt him for a second.

## The aim: to recognize the work and dedication of volunteers

Jürgen Schaab is one of many people at thyssenkrupp Steel who give up their spare time for a good cause. To strengthen and support their work, a new "steel heroes" association Förderverein Hüttenhelden e.V. has now been set up. Employees who promote education, equality, and social responsibility in their local community can apply to Hüttenhelden for financial support. They will then receive funding for their project, which can be used to pay for urgently needed equipment, advertising material, or a planned event, etc.

"There are a lot of people here who have been volunteering – some of them for many years – for the good of the community," says Nicole Sommer from the Corporate Citizenship team at thyssenkrupp Steel. "We want to give this work greater visibility and recognition. And of course we hope that this platform will also inspire others to get involved."

## Experience shows volunteering is not a one-way street

Corporate citizenship has always been a top priority at thyssenkrupp Steel: The focus is on activities in communities close to our plants,







often with the aim of addressing social and educational inequalities. Local partnerships, mostly with small clubs and initiatives, play a central role.

From this corporate citizenship work came the idea to recognize employees' social engagement. But promoting volunteer work is not a one-way street. Nicole Sommer: "A sense of responsibility is a character trait. It's also reflected, of course, in the way people go about their work and characterizes exactly the kind of people we need in our company."

Maximilian Komp is one of those people. As a sales management specialist, he deals with key financial figures and legal requirements with respect to pricing. After work, he dedicates his time to a topic which men, especially, can find difficult to address: mental health problems, particularly depression. To rectify

this, Maximilian Komp and a friend started up a group they named "Gefährten mit Bärten" (friends with beards).

### The basis: an open corporate culture

"Through our initiative, we are encouraging others to deal openly with depression, to get the information they need and link up with others affected," says the 29-year-old. His light-hearted social media posts and authentic viewpoint speak above all to millennials – people aged between 20 and 35. "Five years ago I was severely depressed myself," says the motorbike enthusiast. A colleague advised him to seek help. "I'm still grateful for the openness shown to me by the company doctor and many others at thyssenkrupp Steel." This positive experience inspired Maximilian Komp to invest a lot of his spare time in building his network of "friends with beards".

Meanwhile, in addition to taking his weekly "Over-50s POWER" training sessions, Jürgen Schaab sits behind the reception desk at Budokan, personally welcoming bodybuilders and Thai boxers of the future.

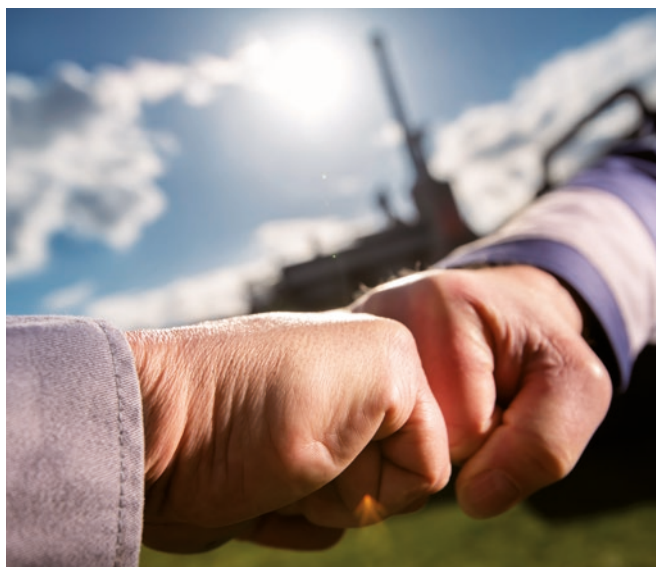
Which vocational skills does he bring to his volunteer work? He thinks for a moment. "It's the other way round," he says. "Dealing with different people all the time here at the sports club helps me in my job. At the plant, work can be really tough and stressful. So it's good to be able to listen and empathize." A skill that our steel heroes have in spades.

### Web

Hüttenhelden e.V. is open to new applications – and patrons. For more info: [www.huettenhelden.de](http://www.huettenhelden.de)

### Contact

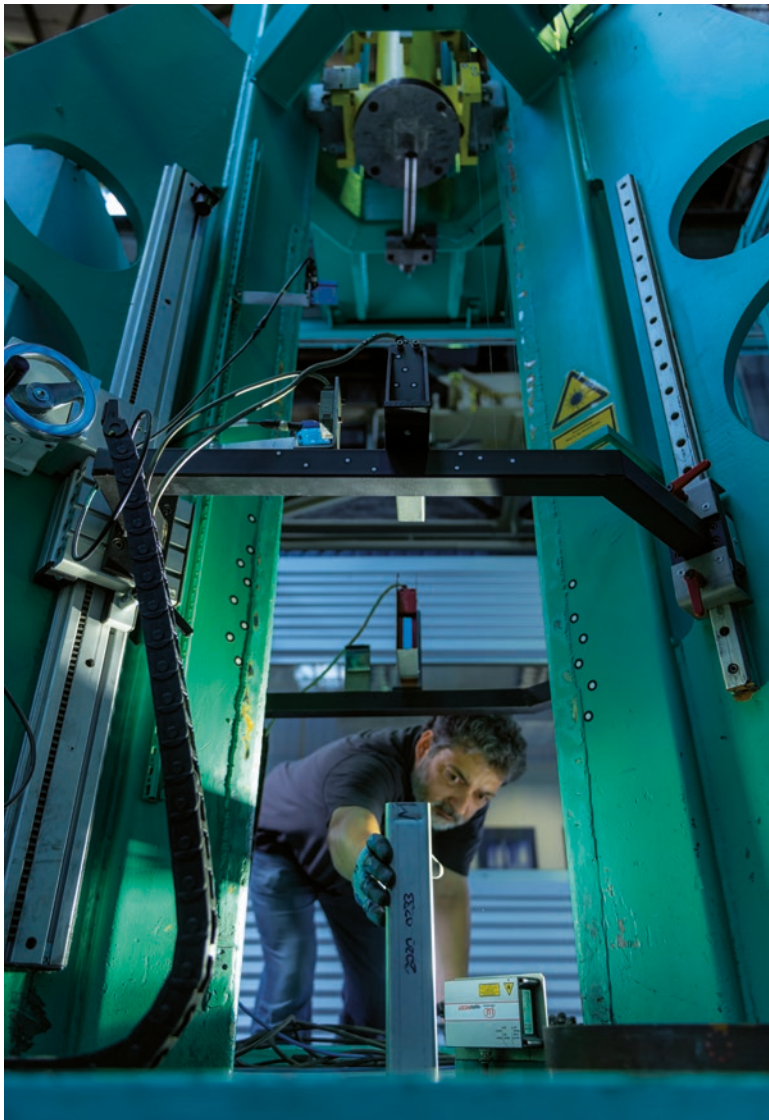
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# Expert analysis of materials and surfaces

The **Materials Testing** department of thyssenkrupp Steel is one of the top addresses in Germany when it comes to analyzing steels, metallic coatings, pre- and post-treatments as well as consumables and charge materials. The highly specialized team offers a comprehensive service: from sample preparation and routine testing to answering highly specific questions.

Copy Jan Ritterbach



## From brutish to ultrafine

How materials are analyzed by means of crash testing and in the lab.

If you want to put a tough material like steel through its paces, you sometimes need to take the proverbial “sledgehammer approach”. No one knows this better than Dr. Anastasia Höhne. Among other things, the mechanical engineer is responsible for testing the properties of materials at thyssenkrupp Steel’s Materials Testing department. For instance, she tests how a car

From sample preparation and routine testing to answering the most complex questions – the interdisciplinary team of specialists in Materials Testing offer a comprehensive set of services to customers. The picture shows a sample being prepared in the drop tower.



body steel deforms in the event of a collision. However, since such crash behavior can only be analyzed using brute force, Höhne has what's known as a drop tower at her Dortmund test facility. This is a vertical test setup in which a weight weighing up to 236 kilograms is dropped onto a material sample from a height of up to ten meters.

### Brutal for greater transparency

"With the help of the drop tower, we can simulate 50 km per hour impacts," she explains. Only a very few laboratories in Germany are capable of performing such an uncompromising test procedure. Even more extraordinary is the fact that the tests can be recorded using a high-speed camera and stored as video files. These can then be synchronized with the measurement data and supplied to the customer. Anastasia Höhne: "This high degree of transparency is a unique selling point of the drop tower tests carried out by thyssenkrupp Steel."

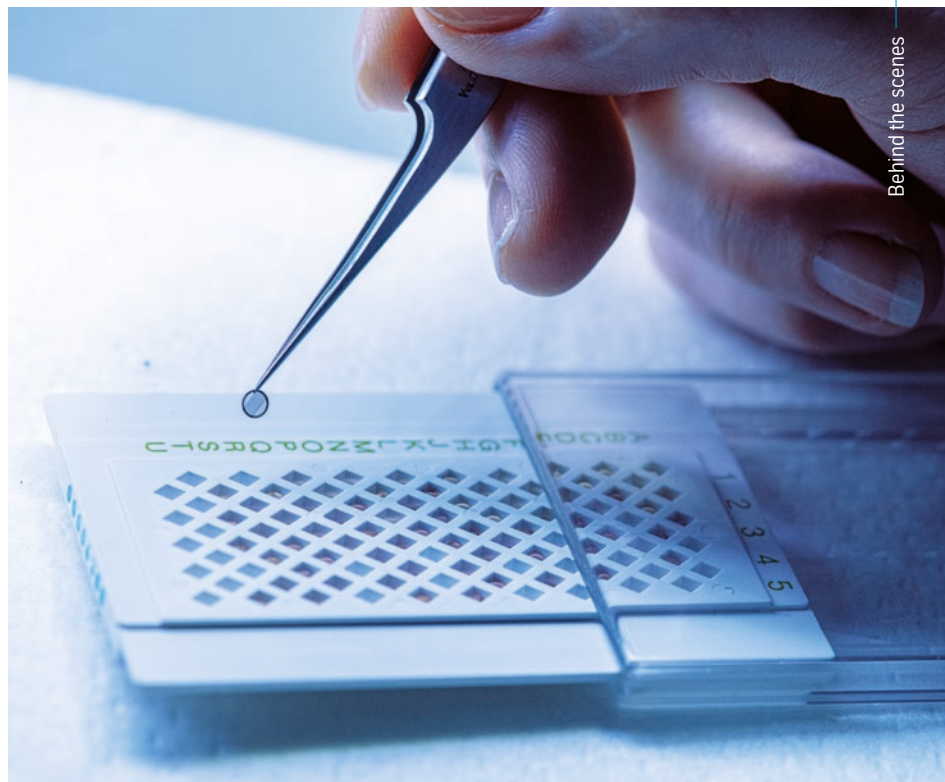
Armed with the knowledge gained from the materials tests, the team supports its clients in various ways. This includes analyzing deformation processes or formability. Based on their investigations, the experts can, for example, identify what influence manufacturing or joining processes can have in the event of a crash. Materials testing also generates added value when developing new products, such as structural components with high stability requirements for the automotive industry.

### Sophisticated troubleshooting

Particularly when developing innovative steels for the automotive industry and its suppliers, the properties of the potential new materials are analyzed with the aid of electron-optical methods, such as the transmission electron microscope, or TEM for short. This is a 2.5 meter-long, column-like device in which an electron beam is generated. Materials technician Andrea Klemmer can use this beam to examine extremely thin material samples – as thin as 0.01 millimeters. The results of this process are documented at a magnification of up to 600,000. This enables the finest precipitates and crystalline defects, such as inclusions, stacking faults, grain and subgrain boundaries in the steel, to be visualized.

Energy-dispersive X-ray microanalysis (EDX or EDXMA) and selected area diffraction are then used to determine the chemical composition and nature of precipitates and phases that are on average smaller than 5 nanometers. Along with grain size and microstructure, these ultrafine precipitates, which are invisible to the naked eye, are the decisive factors for the properties of steels, such as strength and formability.

The Materials Testing unit at thyssenkrupp Steel specializes in the preparation of carbon



extraction replicas for evaluating the ultrafine precipitates in steel. In this process, precipitates such as carbides, nitrides and the like are "extracted" and therefore remain in their original distribution and arrangement in the sample. Another advantage: "The test result can be obtained quickly and inexpensively with this procedure," explains Andrea Klemmer.

**Faced with constantly rising requirements, many steel processing companies increasingly need expert advice and support in the analysis of materials.**



**Dr. Anastasia Höhne is a mechanical engineer and tests material properties using the drop tower.**



**Materials technician Andrea Klemmer is responsible for analyses using the TEM.**



# Long-term stress in time-lapse mode

How the lifespan of products exposed to weathering can be simulated in short time intervals.

**W**hen materials are to be exposed to extreme corrosive conditions, manufacturers and processing companies always need to ask themselves how resistant these materials are. For example,

when does an automobile body begin to corrode as a result of weathering and how does this affect its lifespan? To find this out, the Materials Testing department of thyssenkrupp Steel uses a wide range of test equipment at its Dortmund site. For example, this includes testing the adhesion of paint to typical automotive coating structures, simulating the condition of oiled coils on delivery and consequently their temporary degree of protection against corrosion, and monitoring the exposure of samples to a corrosive atmosphere. Complex climatic tests and the monitoring of corrosion behavior under natural weathering also require sophisticated and expensive equipment – more precisely, two special test chambers of different sizes. The small, two cubic meter chamber offers space for compact standard samples, while the 15 cubic



Process engineer Simone Reiter tests how materials behave under corrosive conditions.

meter walk-in chamber also enables real-life components to be tested – even several samples at the same time.

In these chambers, it is possible to simulate – within the space of a few weeks, in some cases even within a few days – how steel behaves and changes over the long term under corrosive conditions. Three factors in particular play an important role in these tests: high salinity, high humidity, and high temperature. “Of course, test chambers are not capable of replicating the full range of weather conditions possible in the real world or the conditions a vehicle is subjected to on the road,” explains process engineer Simone Reiter. “Nevertheless, we can venture an estimate of a material’s longevity based on the results we obtain, and we can do after just a short time. In addition, we are able to directly compare materials and surface finishes under challenging conditions,” Reiter continues.

## Stress tests in the interests of our clients

To further intensify the impact of the stress test on the material, the employees of the Materials Testing department deliberately damage the material’s surface. Typical types of damage inflicted include scratch marks and stone chipping, which give the experts an additional indication of whether or not a steel will stand the test in a corrosive atmosphere. “We carry out these tests so that our product developers discover the strengths and weaknesses of our materials with respect to their longevity. We never want to use our customers as guinea pigs – we test our products ourselves and offer our expertise as a service,” stresses Simone Reiter. Such as we are doing right now, helping to choose suitable coating systems for steel-based battery housings for electric cars.



In thyssenkrupp Steel’s test chambers, different weather conditions are simulated for testing material samples.

# Detective work at corrosive crime scenes

How electrochemical analyses help us understand and predict the corrosion behavior of materials.

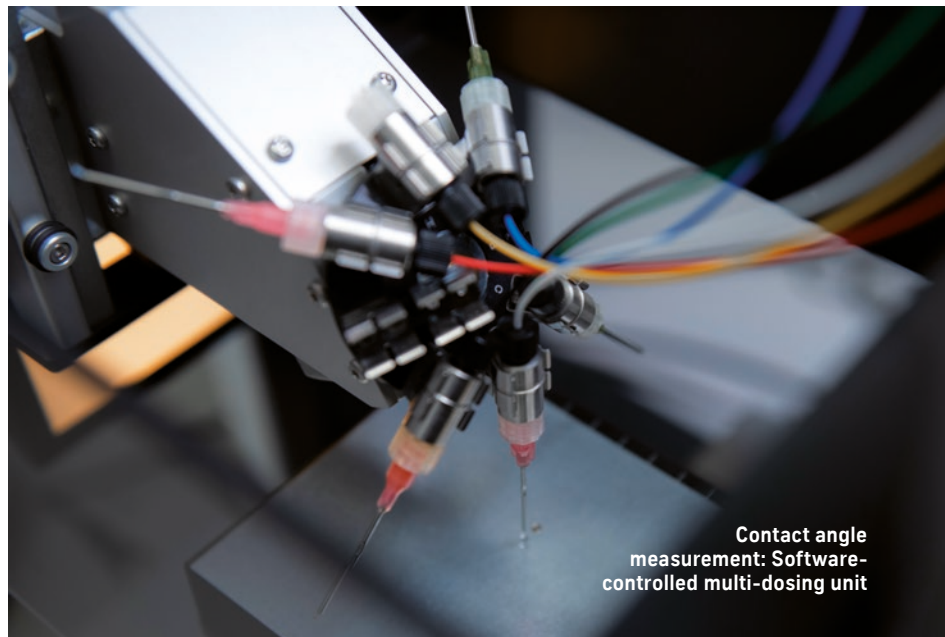
**C**ooperation between manufacturing and processing companies relies heavily on the exchange of information. For example, when developers and the customer want to understand in detail why a material surface or coating reacts in a certain way. Such as when visible changes are observed on the surface. This requires taking a closer look at the phenomena. And this is exactly what's done in the electrochemical lab of the Materials Testing unit at thyssenkrupp Steel. "We offer customized analyses for our external and in-house customers," says electrochemicals expert Dr. Stefan Krebs. "We clarify the causes if corrosion has crept under the paint at the cut edge of a fender or if localized corrosion has formed in heat-affected zones of welds and this could lead to rust perforation."

## Probing for clues

Whereas Sherlock Holmes had his trademark magnifying glass, Krebs and his colleagues have a scanning Kelvin probe. This is a needle-like measuring instrument that can be used to scan and examine the surface of a material sample without touching it – generating high-resolution images almost totally independent of the geometry of the sample. If, for example, it is suspected that errors during cleaning or pretreatment could be responsible for localized detachment of the paint, the Kelvin probe can help: With great precision, it detects defects at the micron level – and therefore not detectable with the human eye – and determines their cause. The probe is capable of measuring through the paint, so to speak, and of detecting which electrochemical process has led to the defect.

What's more, the diffusion of hydrogen in high-strength steels can be monitored time- and spatially resolved using the probe. Stefan Krebs: "This data can be used to verify or adjust simulation calculations of hydrogen diffusion."

In addition, the laboratory also has tools that can be used to take measurements actually in production facilities on site. For example, mobile devices can be used to perform contact angle measurements on surfaces. These are important, among other things, for checking how well cleaned sheet steel is during further processing. A high-tech camera measures in



Contact angle measurement: Software-controlled multi-dosing unit

just a few seconds whether a drop of water wets the material well or whether there are still oil residues that prevent this from happening. Depending on the result, a prediction can be made regarding the state of cleaning or wettability with organic coatings.

"Contact angle measurements can serve to check during day-to-day operations that liquids applied to the steel are evenly distributed and that no drop formation or unwetted areas occurs at any point," says Krebs, emphasizing that the process is "pragmatic, fast and flexible."



Dr. Stefan Krebs is analyzing wetting properties of steel sheet surfaces.

## Web

For more info on the work performed by Materials Testing, go to: [www.thyssenkrupp-steel.com/materials-testing](http://www.thyssenkrupp-steel.com/materials-testing)

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# perdur<sup>®</sup>: Wear-resistant cut-to-length sheet and a strong partnership



**perdur<sup>®</sup>** is the new brand when it comes to innovative, wear-resistant cut-to-length sheet metal coupled with a comprehensive service package.

# 1

## The new name

The name given to the latest member of our family of cut-to-length sheet products is a portmanteau of the words “performance” and “durability”, referring to their exceptional resistance to wear. The resulting perdur<sup>®</sup> is replacing the old product name XAR<sup>®</sup>. perdur<sup>®</sup> is suitable for components subject to heavy wear in mining and earthmoving machines, dumper skips, transport and crushing units, scrap presses and agricultural machinery.

# 2

## Ideal for satisfying custom requirements

thyssenkrupp Steel's perdur<sup>®</sup> 400 and perdur<sup>®</sup> 450 are versatile cut-to-length sheet products that combine wear resistance with good processability. Their standout feature is their guaranteed toughness combined with all the advantages of this proven hot rolled sheet portfolio. State-of-the-art alloy concepts with a low carbon equivalent and optimally matched to the thickness range ensure good cutting and folding properties. This is complemented by comprehensive customer support ranging from materials consulting and innovation to application and process optimization.







# 3

## All advantages at a glance

Greater wear resistance

Guaranteed hardness and toughness

Maximum surface quality and flatness

Good cutting and welding properties, better formability

Potential for lightweight design saves costs and weight

Applications know-how and expertise in innovation

## Web

You can now find all the information you need about the cut-to-length sheet portfolio online at:  
[www.coilplate.com](http://www.coilplate.com)

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gekocht  
gewalzt  
veredelt



# One and the same thing but green

thyssenkrupp Steel is preparing the ground for **climate-neutral steel production.**

thyssenkrupp Steel produces around 11 million metric tons of steel every year. But also 20 million metric tons of CO<sub>2</sub> – just under 2.5 percent of Germany's total carbon emissions. In order to turn these 20 million tons into zero, a number of departments are working extremely hard to enable the company to achieve climate neutrality. In episode 3 of the podcast “gekocht, gewalzt, veredelt”, Matthias Weinberg and Roswitha Becker from the Metallurgy Competence Center explain in detail what this looks like and what concrete plans exist to make Germany's largest steel mill fit for the future.

The discussion focuses primarily on the practical challenges that will have to be overcome in the coming years: from the construction of new plants and the supply of green energy to the question of how a full range of high-quality steel grades can be guaranteed in the future. It's worth a listen!

## Web

“gekocht, gewalzt, veredelt” is posted monthly and can be accessed here:  
[www.thyssenkrupp-steel.com/de/publikationen/podcasts/podcasts.html](http://www.thyssenkrupp-steel.com/de/publikationen/podcasts/podcasts.html)

## Contact

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