

steel

compact



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a climate-neutral future.

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Credits

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“A historical turning point in Europe”

February 24, 2022, is a date that will be engraved in our memory. The day when the Russian Federation invaded Ukraine, bringing war and suffering to its people, marks a turning point in the history of Europe. One can only agree with Chancellor Scholz in this judgment. What does this turning point mean for Europe, for our economy, for our society?

The crucial thing is that Europe must continue to stand up resolutely to Russian aggression. For the assault on Ukraine is also an assault on our free and democratic societies, on our way of life and of doing business. Isolating Russia politically and economically under its current leadership in a determined but judicious manner is the right approach.

One lesson learned, however, is that Europe must break free from unilateral dependencies and become more resilient. Above all, the dependency on Russian oil and gas must be ended – this is especially true for Germany. Once again, we are becoming aware of how vulnerable international supply chains are – as exemplified by cable harnesses for automotive production.

So far, thyssenkrupp Steel has also sourced raw materials from Russia, mainly ore and coal products. We have swiftly found and switched over to alternative sources of supply, thus securing our production capability. But it is also true that this cannot be done overnight. And it is not alarmist to say that suddenly stopping the gas supply would have unforeseeable consequences for the German economy. If the worst comes to the worst we would have to shut down and close plants.

This war has further direct implications: Although we consider the spin-off of the steelmaking division as the best option, it is currently impossible to take this measure in view of the unstable situation. However, we remain committed to that goal.

This also applies to our future-oriented investment projects as part of Strategy 20-30 and to the transformation to climate-neutral steel production. We have systematically implemented both. The



Bernhard Osburg,
CEO thyssenkrupp Steel Europe AG

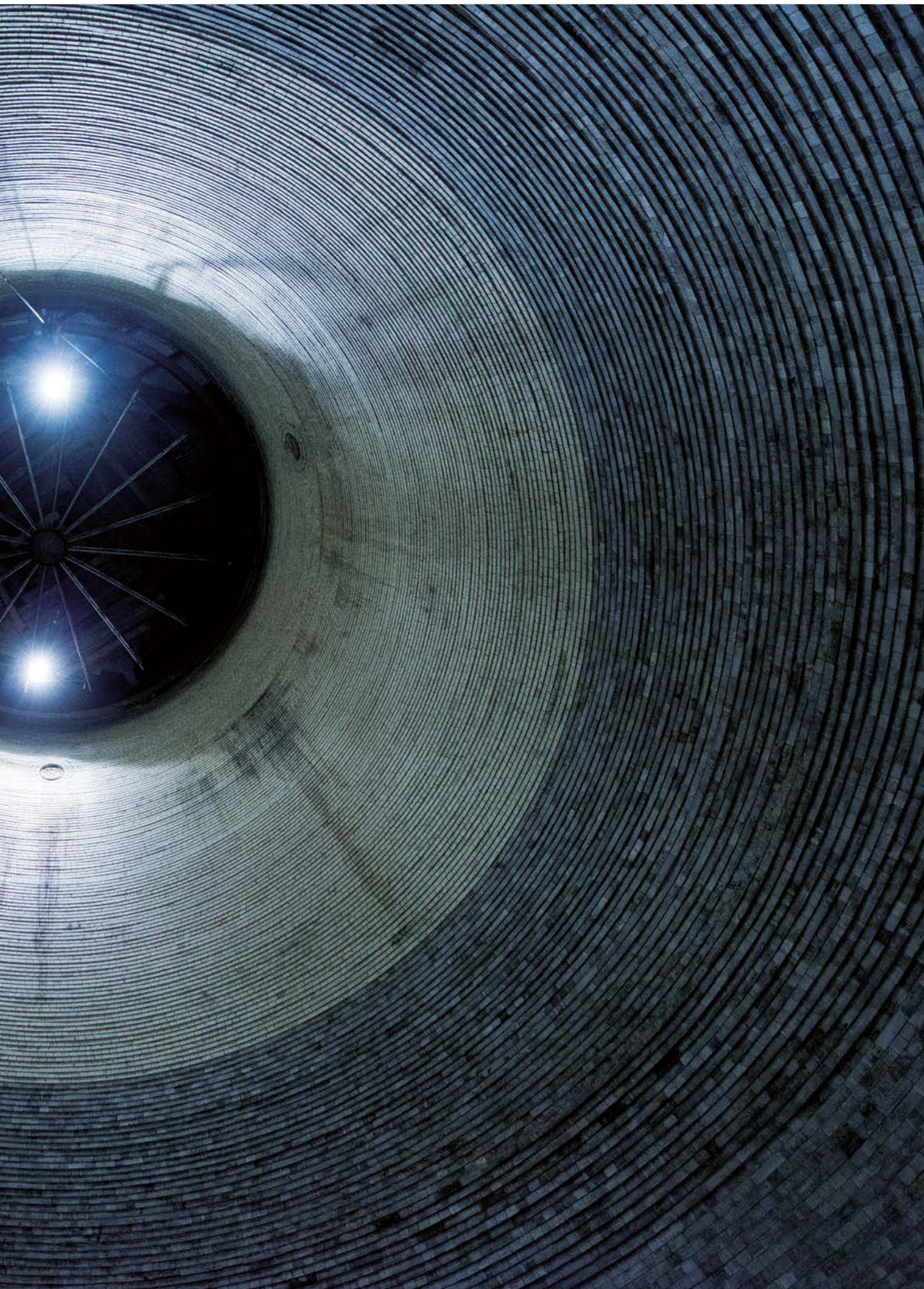
transformation in particular cannot be delayed. Successful implementation would also mean creating a more independent Europe with a strong basic materials industry based on renewable energies. We should mobilize all forces to achieve this goal.

In order to pursue this path even more consistently, we have made important changes in the Executive Board of thyssenkrupp Steel Europe AG. Effective May 1, our present Chief Technology Officer Dr. Arnd Köfler will be responsible for the transformation and optimization of the production network as part of Strategy 20-30, as well as R&D in an integrated transformation and innovation directorate. Dr. Heike Denecke-Arnold will join the Executive Board and be responsible for the entire operating production area from upstream operations down to the finishing stages. Her successor as CEO of the Management Board of our subsidiary thyssenkrupp Hohenlimburg GmbH will be André Matusczyk, currently Head of Sales Automotive at thyssenkrupp Steel Europe. He will be succeeded by Simon Stephan, previously General Manager of our Chinese joint venture Tagal.

Recently, at the beginning of April, we welcomed our new Chairman of the Supervisory Board: Sigmar Gabriel, a strong personality with with broad political and economic experience. These changes in the boards underline that we continue to pursue our future course. We have made our contribution towards steel remaining an essential basic material in a free and hopefully once again peaceful Europe.

Colossus on its last shift

It is a once-in-a-generation event: Relined and equipped with state-of-the-art technology, thyssenkrupp Steel's "Schwelgern 1" blast furnace is expected to start its last shift at the end of 2021. For more than 13 years the blast furnace was in continuous operation before it was shut down for relining last summer. After a three-month downtime and an investment in the mid double-digit million euros range, the blast furnace has resumed operation. On its sixth "firing" it will continue to produce around 10,000 tonnes of high-quality pig iron every day. The partial relining was perhaps the last in the history of thyssenkrupp Steel. On the way to climate-neutral steel production, the company will be gradually replacing its classic blast furnaces with climate-friendly direct reduction systems from 2025. In the future, these will be powered by green hydrogen.



Knowledge & value

Steel grades

Standard practice!

So that the automotive and components industry can use new and modified steel sheets, they must first be approved in a process for assessment of the joining technology. A uniform process is ensured by what are called steel-iron test sheets (SEP): They define what needs to be considered in the testing and documentation of material parameters. The series is published by the Düsseldorf Steel Institute VDEh. After a restructuring phase lasting several years, the organization is revising the first parts of SEP 1220 at the moment for the joining suitability of thin sheet. The focus is on the process sheets entitled "Resistance spot welding", "Laser beam welding" and "MIG brazing". Part 5 "MAG welding" has already been published. Further testing and documentation guidelines are to follow in the next few years. More information at: <https://vdeh.de/normung-standardisierung/stahl-eisen-blaetter/>



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.



from l.: Bernhard Osburg, CEO thyssenkrupp Steel, Dr. Marie Jaroni, Head of Decarbonization & Sustainability thyssenkrupp Steel, Federal Minister for Economic Affairs and Climate Action Robert Habeck and Martina Merz, CEO thyssenkrupp AG, met at the end of February at the plant facility in Duisburg.

Politicians aim for transformation

German Economics Minister Robert Habeck assured thyssenkrupp Steel of his support for the conversion to climate-neutral steel production.

"Our common goal is green steel made in Germany. This is the business model of the future," said Robert Habeck during a visit to thyssenkrupp Steel in Duisburg at the end of February. The German Federal Minister for Economic Affairs and Climate Protection visited Europe's largest steel facility to find out more about the path to climate-neutral steel production. On behalf of the German government, the Economics Minister held out the prospect of introducing climate protection contracts in addition to investment cost subsidies. In addition, he said, the government is committed to a significant expansion of hydrogen generating capacities and the development of the relevant infrastructure.

For the year 2030, the German government is expecting a demand between 90 and 110 TWh. Around 10 TWh of the climate-friendly gas will be required by thyssenkrupp Steel as early as 2030 as part of the switch to hydrogen-based direct reduction plants. "I am convinced that the steel industry can become the flagship of the climate-neutral economy," Habeck said. The view is similar in Duisburg, as steel boss Bernhard Osburg emphasized. In view of international competition, the Group must now swiftly implement its ambitious climate strategy. "We are ready for the transformation, our plans are ready for implementation," said Bernhard Osburg.



With bluemint® We can already offer steel today in all required grades and tried-and-tested quality with a reduced carbon footprint."

Dr. Marie Jaroni, Head of Decarbonization & Sustainability thyssenkrupp Steel

➤ Read more starting on page 8



New appearance for a new era

A leading supplier of electrolyzers has renamed itself: thyssenkrupp Uhde Chlorine Engineers (UCE) has become thyssenkrupp nucera.

Everyone is talking about green hydrogen – it is manufactured in thyssenkrupp nucera's plants. With more than 50 years of experience, 600 completed projects and 240,000 electrolysis cells produced, the company is one of the global market leaders in the chlorine-alkali electrolysis segment. "We can already supply electrolysis cells with a total output of one gigawatt per year," says Denis Krude, CEO of thyssenkrupp nucera. "This is just the beginning. We aim to become the technology leader for the manufacture of green hydrogen on an industrial scale."



This ambition is reflected in the brand name: nucera is made up of "new", "UCE" and "era". Innovation, transformation and green energy are all part of the company's brand promise to help customers around the world on the path to carbon neutrality.

3 questions for ...



Rüdiger Schorn, Product Manager Electric Strip at thyssenkrupp Steel

1 Mr. Schorn, what is powercore® Traction?

Our powercore® Traction electrical steel is the logical further development of our non-oriented (NO) electrical steel for the high demands of electric mobility: High efficiency for long ranges, high torque for maximum driving dynamics, and all this under high cost pressure.

2 How does electrical steel strip drive the electric motor?

Our powercore® Traction grades are used to build what are referred to as rotors and stators. In the process, our grades amplify and direct the magnetic flux in the coils. However, there are very different motor types and drive philosophies in current electric vehicles. Therefore, powercore® Traction stands for a product family. We operate our own engine test bench in our application technology department. This enables us to provide our customers with the best possible advice when making their selection.

3 What properties must the electrical steel strips have?

The trick is to always ideally match the three core requirements of low power dissipation, high polarization and mechanical strength to each respective application. A basic requirement is to achieve properties that are as homogeneous as possible over the strip length and width. In conclusion, it can be said that powercore® Traction is a genuine high-tech material that is indispensable for the rapid expansion of electric mobility. This is because it helps to meet the core requirements of electric mobility: high ranges and high torque at comparatively low cost.

Web

More information is available here:
www.thyssenkrupp-steel.com/en/powercore-traction

#nextgenerationsteel

Roll the movie!

Is it possible to tell in two minutes what thyssenkrupp Steel stands for today and in the future? Sure thing! Our new corporate movie presents Europe's largest integrated steel mill and lets employees who are driving our strategy for the future tell their story. For the sustainable mobility of tomorrow. For the energy transition. For tomorrow's markets. For our customers.



In numbers


1 %

of Germany's total annual emissions – that is **six million tonnes of CO₂** – is the savings target for thyssenkrupp already by 2030. For its ambitious goals and climate protection activities, the Essen-based company has now already been awarded the top grade "A" for the sixth time in a row by the nonprofit organization CDP.



Marie Jaroni and Frank Ahrenhold look to the near future: The strategist and the production expert look at the model of a direct reduction plant.





Construction industry, energy supply, packaging industry – in order for Germany to achieve the goal of **climate neutrality**, fundamental changes are being initiated in all sectors. CO₂-reduced bluemint® Steel from thyssenkrupp plays a central role in this.

Copy Katja Marx

Mission Transformation

You don't change a bathtub every day. "Many of our products have been in use for 30 years or more," says Christian Graap, Managing Director Technology at the bathroom supplier, Kaldewei.

Premium quality and a timeless product design have always been key selling points for the family-owned company. The manufacturer of bathroom articles made of recyclable enameled steel is doing everything in its power to safeguard future generations, and is placing even greater focus on sustainability. In summer 2021, Kaldewei became the first company in the sanitary industry to join the Science Based Target Initiative (SBTI), and has since been working to reduce its own carbon footprint in line with the Paris Climate Agreement

CO₂-reduced flat steel for premium baths

Kaldewei sees the greatest lever on the path to climate neutrality in the conversion of the primary material to green steel. "Steel is the optimum material for us because of its robustness, its good formability and, not least, its recyclability. However, its coal-based production is reflected in the CO₂ balance of our own products," observes Christian Graap. This is changing with bluemint® Steel, the first steel product from thyssenkrupp Steel with reduced CO₂ intensity. "The use of bluemint® Steel is an important step toward achieving our own climate goals."

You ask, we deliver: In October 2021, CEO Franz Kaldewei personally ordered the first

delivery of bluemint® Steel. "With the certified product, all direct emissions are neutralized through CO₂ savings in the production process," explains Jörg Paffrath, Head of Industrial Sales at thyssenkrupp Steel: "This means we can already offer our customers a high-quality CO₂-reduced steel product." In specifics terms, the CO₂ intensity per tonne of steel is reduced by a good



With bluemint® Steel, we can already offer our customers a high-quality CO₂-reduced steel product."

Jörg Paffrath, Head of Industrial Sales
thyssenkrupp Steel





KALDEWEI
nature protect

70 percent. Among other things, Kaldewei uses the material in the limited “Kaldewei nature protect” product series, which, in addition to attractive bathtubs, shower trays and washbasin bowls, also provides customers with a certificate showing the CO₂ savings compared to standard products.

Kaldewei marketing manager Yvonne Piu is pleased with the response to the new line: “Particularly in the upper price segment, we are seeing a growing willingness among our customers to include sustainability aspects in their purchasing decisions. We are using this willingness to promote sustainable materials more strongly in the future. Clear labeling at the point of sale and comprehensible information on our sustainability measures are important, and we communicate this primarily through our public relations work.”

bluemint® Steel: On the way to climate neutral steelworks

Change of perspective: In Duisburg, Dr. Marie Jaroni, Head of Decarbonization & Sustainability, looks from the meeting room to the ten square kilometer site, which over the next 20 years is to become a laboratory and pacemaker for the transformation to climate-neutral steel production. The decisive technological step here will be the replacement of the coal-based blast furnaces with direct reduction plants powered by green hydrogen in the future. The first plant is scheduled to go into operation in 2025. To prepare for this decisive milestone, a direct reduction test facility is being installed among other things as part of the H2Stahl joint project funded by the German government and the



bluemint® Steel from thyssenkrupp is used in the model series “Kaldewei nature protect”.



The use of bluemint® Steel is a further important step towards reaching our own CO₂ goals.”

Christian Graap, Technical Managing Director
Kaldewei



state of North Rhine-Westphalia. Key process parameters are to be investigated there to ensure a smooth transition to the later large-scale plant. The transformation of thyssenkrupp Steel is thus taking the next stage. The transformation of thyssenkrupp bluemint® Steel, the company's customers are already being given the opportunity to benefit directly from this.

"We are getting very good feedback on our CO₂-reduced steels," says Marie Jaroni. "And the logic behind the product is also well understood." For example, the balance sheet approach, which allows the real CO₂ savings in the blast furnace process to be allocated to a clearly defined part of the steel produced, pays off. "This means that we can already offer all desired grades in proven quality with a reduced carbon footprint and also guarantee that there will be no need for any change in existing manufacturing processes on the customer side."

CO₂-reduced electrical steel for the energy industry

The Regensburg-based company SGB-Smit also intends to switch as quickly as possible to high-performance steels that also reduce CO₂

emissions. The manufacturer of transformers is supporting the energy supplier E.ON in setting up a decentralized supply network in which the share of wind power, photovoltaic and biogas plants is steadily increasing. Transformers play a central role in the energy transition, as they ensure the conversion and transmission of green electricity. To ensure that this happens with as little loss as possible, high-tech steels are used in the transformers: Highly efficient grain-oriented electric strip of the Powercore® brand from thyssenkrupp Steel.

"We are one of the few suppliers on the market whose products meet the strict requirements of the new EU Ecodesign directive on energy efficiency," says Georgios Giovanakis, Managing Director thyssenkrupp Electrical Steel. The business area has now further extended this competitive advantage: Only thyssenkrupp Steel currently offers grain-oriented electrical strip with a 50% reduced carbon footprint compared to the standard version. For this purpose, an already pre-reduced iron – referred to as Hot Briquetted Iron (HBI) – is used in the blast furnace, which reduces the use of coal.

The first 50 tonnes of bluemint® powercore® were secured by transformer specialist SGB-Smit. "For us, it represents a great added value that the top grades of thyssenkrupp Steel are now also CO₂-reduced. This is an important step towards further decarbonization of the energy process chain," says Managing Director Holger Ketterer. In order to effectively reduce CO₂, the SME company has set itself two goals: to continuously reduce energy losses in the utilization phase of the transformers and to cut the carbon footprint of the transformers themselves. Holger Ketterer: "With the first goal, the energy transition is dealing us a good hand. The more renewable energies are used, the lower the CO₂ emissions from energy losses. That's why our focus is already clearly on the climate impact of the materials we use." SGB-Smit is therefore following the first hydrogen injection trials in the blast furnace with great interest, and the switch to direct reduction announced by thyssenkrupp Steel.



Contribution to the energy transition: SGB-Smit uses bluemint® powercore® for manufacturing modern transformers.



Our focus is already clearly on the climate impact of the materials we use."

Holger Ketterer, Managing Director SGB-Smit





(from l.) Holger Ketterer, Managing Director SGB-Smit, Achim Hübner, International Category Lead for transformers at E.ON and Georgios Giovanakis, CEO thyssenkrupp Electrical Steel at the handover of the first CO₂-reduced electrical strip.

Strong alliance with Responsible Steel

Strong alliances are needed to produce and use steel sustainably along the entire value chain. For this reason, thyssenkrupp Steel has joined the global multistakeholder

ResponsibleSteel

initiative. In the nonprofit organization, companies, civil society groups and associations are working to develop standards for responsibly produced steel – from the procurement of raw materials right through to the recycling of steel after the utilization phase. Steel companies have also been able to obtain certification under the ResponsibleSteel standard since November 2019, demonstrating that they comply with a wide range of social and environmental criteria. These include aspects such as health and safety, greenhouse gas emissions, water management and biodiversity, human rights, and community relations.

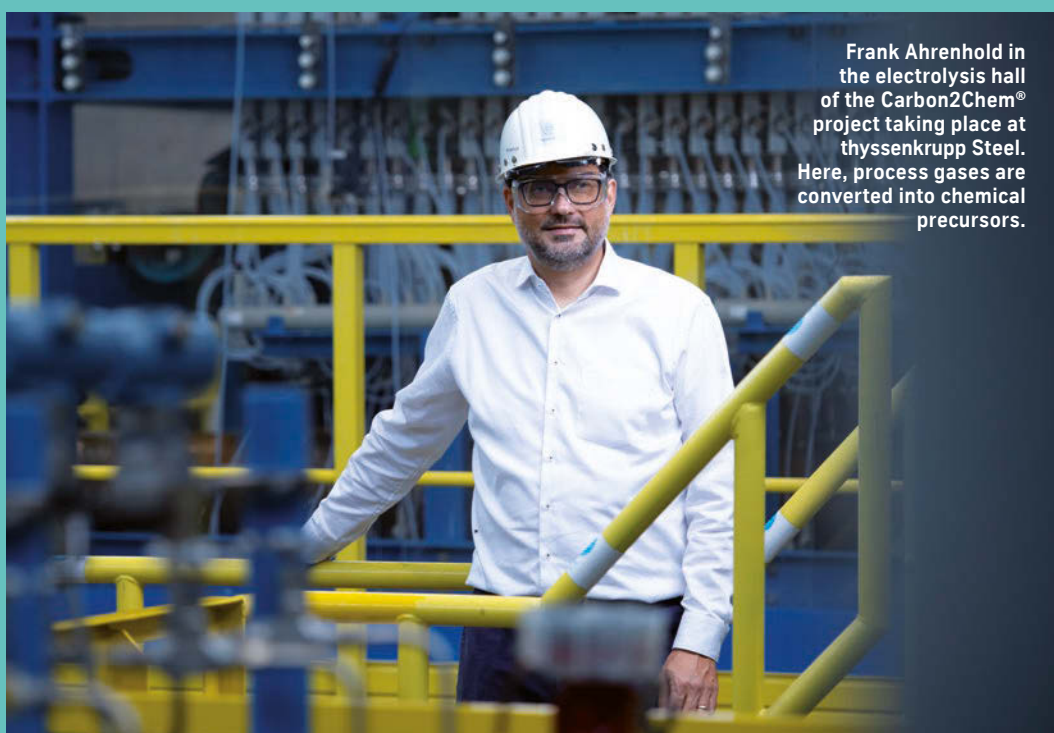
Hydrogen: Driver of the transformation

“Hydrogen will be of central importance for steel production in Duisburg,” says Dr. Frank Ahrenhold, head of sustainable steelmaking at thyssenkrupp Steel. “The gas is technologically the only way to replace coal as a reducing agent in pig iron production. And with the huge advantage that water vapor and no CO₂ is then produced in the process. The leverage for climate protection is thus unique across industries: With one tonne of hydrogen, we save 26 tonnes

of CO₂.” To meet the sharp rise in hydrogen demand in the long term, thyssenkrupp Steel is already cooperating with partners to secure national and international supply sources.

A test series is running at the same time, its results are eagerly awaited far beyond the borders of Duisburg: the use of hydrogen in the direct reduction process. This is because up to now, the DR plants already used in steel production have been operated with natural gas. “A key question in both experimental

›



Frank Ahrenhold in the electrolysis hall of the Carbon2Chem® project taking place at thyssenkrupp Steel. Here, process gases are converted into chemical precursors.

The first herbal candies in a CO₂-reduced packaging leave the Ricola plant in Laufen, Switzerland (from left): Mark Aegler, CEO of Hoffmann Neopac, Dr. Martin Messerli, Chief Operating Officer of Ricola, and thyssenkrupp Rasselstein CEO Dr. Peter Biele.



setups is how we need to inject the hydrogen so that it reacts effectively with the oxygen in the iron ore,” explains the metallurgist. Measurement technology will, in particular, monitor every single substance stream and every iron ore grade used in the planned 20-meter tall DR test plant. “We’re doing basic research here that will contribute significantly to the transformation of the global steel industry toward climate neutrality.”

Climate-friendly tinplate for Ricola herbal sugar

Sustainable and environmentally friendly materials are in high demand in the packaging industry too. With its recyclable cans and tubes, the Swiss company Hoffmann Neopac is one of the industry’s multiple award-winning pioneers.

With bluemint® Steel, Hoffmann Neopac is once again relying on a product innovation made of steel from thyssenkrupp. “We are delighted that our CO₂-reduced tinplate will package and thus effectively protect one of Switzerland’s best-known export products from light and moisture – Ricola Swiss herbal sugar,” reveals Dr. Peter Biele, Managing Direc-



By sourcing CO₂-reduced steels and relying on 100 percent renewable energy in production, we are helping our customers implement an emissions-free value chain.”

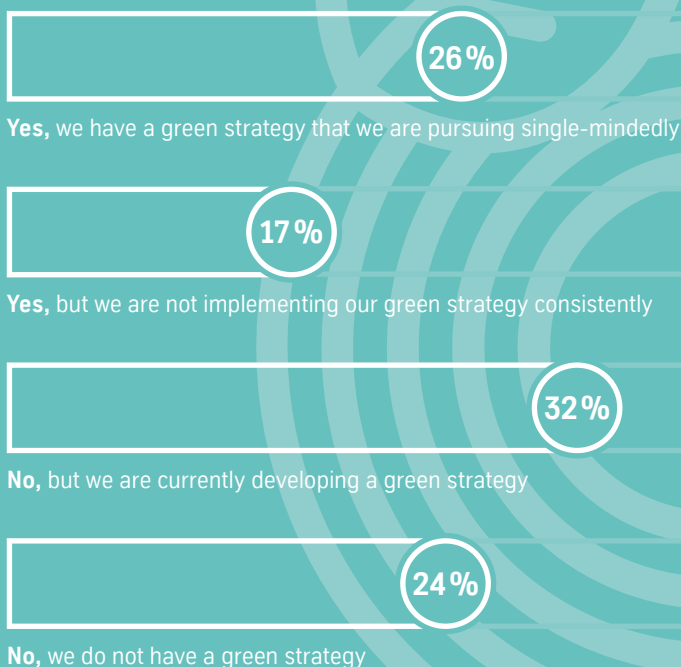
Mark Aegler, CEO Hoffmann Neopac AG

tor thyssenkrupp Rasselstein. A liaison that, according to Martin Messerli, Chief Operating Officer of Ricola, is a good match: "The herbs for our candy specialties are grown in the Swiss mountains and processed in a natural way. This close-to-nature production is one of our brand promises. For us, it is logical in terms of preserving natural habitats that our packaging also becomes increasingly sustainable. bluemint® Steel is another step in this direction."

What is sought: a clear definition

In Duisburg, Marie Jaroni is mainly busy planning the next steps on the road to climate neutrality. "What we need now, and quickly, is an industry-wide definition of green steel," says the strategist. "It will help us differentiate our certified products from alternatives on the market." Meanwhile, the task is to press ahead with the rebuild of Europe's largest steel mill. Marie Jaroni's schedule is full: Approval procedures and investment commitments are being finalized, talks are being held with hydrogen suppliers, and procedural challenges are being solved. The path to a climate-neutral steel mill is a mammoth project that requires a great deal of commitment, coordination and willingness to change from everyone involved. But also one that is worth the effort. "It's incredible what impact we can have with our work," says Marie Jaroni. "At thyssenkrupp Steel alone we will save 2.5 percent of Germany's CO₂ emissions in the future." And what's more: Every tonne of bluemint® Steel helps reduce emissions in other industries. Mission Transition – in full swing!

DOES YOUR COMPANY HAVE A STRATEGY FOR GOING GREEN?



Source: statista survey of 363 companies, fall 2021

Web

More on thyssenkrupp Steel's climate strategy can be found here: www.thyssenkrupp-steel.com/klimastrategie

For further reading: more information about bluemint® Steel: www.bluemint-steel.com

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Planning the next steps taken by thyssenkrupp Steel on the way to climate neutrality: Marie Jaroni.

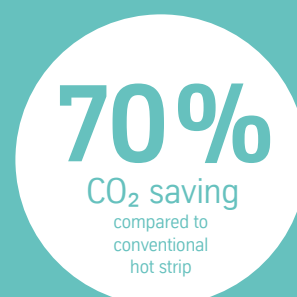
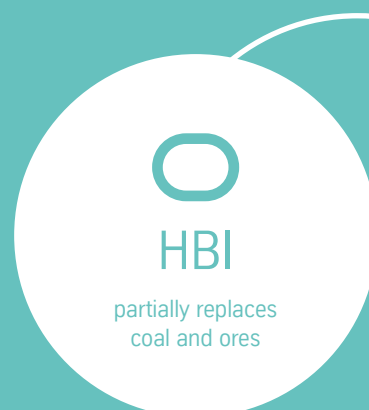


RIGHT HERE. RIGHT NOW.

Save a whole lot of CO₂ today
with bluemint[®] Steel.

bluemint[®] pure – accompanies the transformation

- CO₂ reductions and certification at the Duisburg site, not in the global context
- Balanced CO₂ savings lead to a reduced, product-related carbon intensity
- Perspectives for hydrogen
- WRI/WBSCD GHG Protocol for Product Life Cycle and Reporting Standard
- Certified by DNV



- ➞ **Savings that you can use immediately:**
The CO₂ savings from bluemint® Steel are directly creditable to your Scope 3 emissions
- ➞ **Continue to trust in known qualities:**
bluemint® Steel is produced via the primary steel route – the material properties therefore do not differ from the existing steel grades



bluemint® recycled – recycling pays off

- CO₂ reductions at the Duisburg site
- Balance-sheet recycled product from 100% scrap product
- DIN EN ISO/IEC 17029 and TÜV SÜD VERIsteel standard taking account of ISO 22095
- Certified by TÜV SÜD



In ten years, every other tonne of steel produced globally should be green.”

Steel does not turn green overnight. Until the switch to hydrogen-based direct reduction, real CO₂ savings from the classic blast furnace process are accounted for in green steel products. How does science evaluate this path? And what framework conditions are necessary for green steel to establish itself on the market? Prof. Dr. Stefan Lechtenböhmer of the Wuppertal Institute for Climate, Environment and Energy on the transformation of the German steel industry.

The interview was conducted by Katja Marx



Mr. Lechtenböhmer, one of your main areas of work is the transformation of the basic materials industry toward climate neutrality. How do you assess thyssenkrupp Steel's transformation path?

Direct reduction with green hydrogen is currently the only way to produce primary steel in a climate-neutral way. We are therefore very pleased that thyssenkrupp Steel, like other steel producers, is actively working to switch production to this technology.

In your scenarios, where does the green hydrogen come from that will ensure that the move away from coal-based reduction metallurgy can succeed?

As far as the origin of the green hydrogen is concerned, there are still very high bandwidths in the scenarios. In other words, the options are many, and so are the uncertainties. As locations

for the generation of electricity from renewable energy sources, the North and Baltic Seas as well as the Scandinavian mainland hold very great potential, which should also be used for hydrogen production. Numerous ambitious projects are already in the starting blocks here. The situation is similar in Spain and increasingly in other southern European countries. Countries such as Chile and Saudi Arabia, with their favorable location conditions for solar energy, are also planning to actively enter hydrogen production. For them, however, transporting the hydrogen by ship, either liquefied or as ammonia, is an additional cost factor.

In the long term, coal-based plants will continue to operate worldwide, where steel can be produced much more cheaply. Will greener and thus more expensive steel from Germany and Europe find enough customers?

The markets for green steel currently appear to be growing rapidly. More and more major auto-makers have announced plans to use increasing quantities of green steel. Nevertheless, the foreseeable high additional costs, especially for steel produced with green hydrogen, are a problem. Support for industry via the climate protection treaties currently under discussion is therefore just as important as appropriate protection against carbon leakage. Also, because steel is traded globally, it is of central importance that as many countries as possible pursue similar strategies in parallel. Within the framework of the UN, Germany has already joined forces with several countries as well as major companies to organize demand for green steel and establish markets. And the U.S. has just announced a very similar plan. A transnational steel climate club could emerge from these initiatives, enabling a joint, ambitious and fair transformation of steel production in key producing countries.

How and at what speed will the market for green steel develop in the coming years?

If we do not want to run the risk of cementing massive CO₂ emissions for decades via replacement investments in the blast furnace route,

around half the German primary steel production must be green by 2030, i.e. it must come from direct reduction plants. This is true even though not all plants may yet be able to run entirely on green hydrogen. Worldwide, the figures look similar. Conversely, this means that in ten years' time, at least every other tonne of steel produced globally should be green.

What political framework conditions are necessary to ensure that the transformation is not only technically successful but also achieves the desired success – climate-neutral European steel production?

The fact is that the steel transformation will only succeed if companies, the state and citizens work closely together. For starters, we need strong government support to enable companies to replace coal-based blast furnaces. In parallel, renewable energies as well as electricity and hydrogen infrastructures must be expanded

quickly and massively. This requires not only appropriate funding, but also changes in energy regulation and accelerated planning. And not to forget, acceptance by citizens. It is precisely the broad understanding of the necessity and challenges of transformation that does not come about by itself. Here, companies and politicians, together with trade unions, environmental associations and other stakeholders, still have a lot of convincing to do.

There are now various green steels on the market, but no uniform product definition. In your view, what criteria must a climate-neutral steel meet in order to live up to its name?

Climate-neutral steel emits as few greenhouse gases as possible. This means that the energy should be generated entirely from renewable sources and the small remaining emissions, for example from the electric arc furnace or carburizing, should also be avoided if possible, for example by using biomass.

However, we will not always achieve this standard immediately. Natural gas-based primary steel reduces greenhouse gas emissions by around two thirds. Since speed is of the essence in climate protection, such significant improvements should be part of the strategy. However, this must be a clearly time-limited intermediate step towards complete climate neutrality.

Against this background, how do you assess the accounting model used by thyssenkrupp Steel?

I believe the model is very credible and appropriate. It is based on replacing part of the iron ore in the blast furnace with purchased briquetted iron reduced with natural gas. This has been proven to reduce CO₂ emissions both in the blast furnace and throughout the entire upstream chain. This emissions reduction is then allocated to the exact quantity of steel corresponding to the metal used from the briquetted iron. The company is proceeding with this in an absolutely transparent and comprehensible manner. Particularly because it is being clearly communicated that it will not remain with these first steps. The plan to gradually switch all production to what is then climate-neutral steel proves that this is not a sham solution but a serious first step towards climate neutrality.



If we do not want to run the risk of cementing massive CO₂ emissions for decades via replacement investments in the blast furnace route, around half the German primary steel production must be green by 2030.”

Prof. Dr. Stefan Lechtenböhmer, Head of Department Future Energy and Industrial Systems at the Wuppertal Institute for Climate, Environment, Energy

How digitization helps make cans thinner

More than 210 years old, and still not at the end of its development: The optimization of tinplate packaging such as beverage, food and aerosol cans continues to present the packaging steel industry with tricky challenges. thyssenkrupp Rasselstein is now pursuing an innovative approach with the **finite element method (FEM)** that enables customers to achieve significant material savings.

Copy Jan Ritterbach

Refreshing soft drinks, hearty stews and hairspray that can withstand inclement weather – for all their differences in terms of content, these products often have one thing in common: in the supermarket, they are offered in cans made of tinplate, a thin cold-rolled steel sheet with a tin coating. You don't have to look far to find the reasons for its diverse use: Tinplate is an extremely safe packaging material, which ensures very long shelf life due to the one hundred percent protection against the effects of light and oxygen. In addition, its good processing capabilities and printability are factors in favor of the sustainable material, which can be recycled again and again in a closed material cycle.

Customers' needs drive innovation

The technical development capability of a product can never be fully exploited but there is always scope for further optimization; conse-

quently, thyssenkrupp Rasselstein has been working for some time on making tinplate cans even more precisely tailored to the needs of its customers. The main driver is the desire to use materials even more efficiently.

What is easy to say turns out to be extremely challenging in practice. Food cans have been with us for over two centuries. Over this immense period of time, the design has been adapted and improved countless times, so that when it comes to further optimization, the devil is in the proverbial details. "Our primary levers for further development are process and geometry adjustments," explains Dr. Manuel Köhl, head of Application Technology at thyssenkrupp Rasselstein, the only tinplate production facility in Germany.

Proven process from the automotive industry

The problem: even the smallest changes to the starting material have a major impact on processability. Machines and tools must be adapted to new material properties, as it is not possible to predict how the packaging steel will behave under changed conditions – such as reduced thickness. "This is where the finite element method (FEM) comes into play as a new approach," says Rasselstein's development engineer Ina Weinand. For her, the process already tested in the automotive industry is characterized by the fact that product development and optimization are significantly accelerated by means of virtual analysis of forming and stability processes. Weinand: "The 'trial and error' procedures that are common in the industry can be reduced or even completely avoided in this way." This is a significant step forward, as in earlier days real

In the product development of tinplate packaging, the focus is on meeting customers' needs even more efficiently: Dr. Manuel Köhl, Head of Application Technology at thyssenkrupp Rasselstein.



Development engineer Ioana Weinand has already been researching new processes for several years to make cans out of packaging steel even thinner and more innovative.

sample cans had to be produced by the dozen, sometimes even by the hundred, in order to test the feasibility of new concepts.

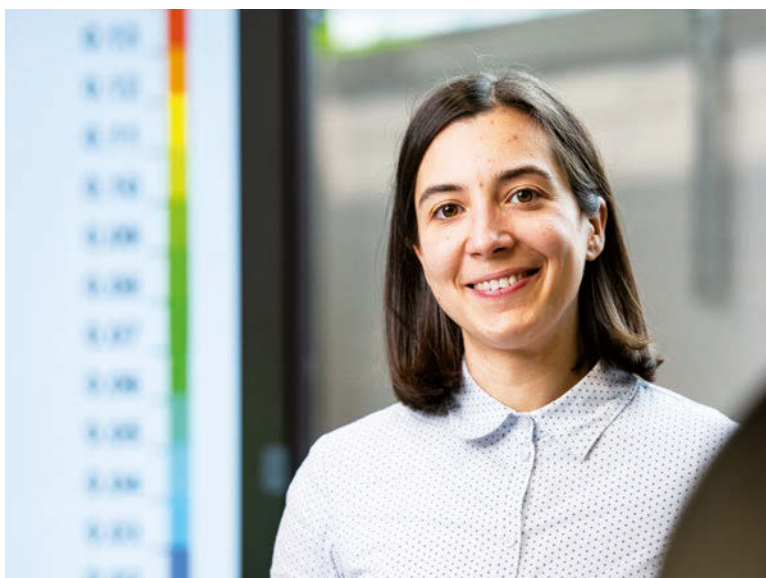
Method is the result of years of development work

“By means of FEM, our customers know even before processing a thinner or innovative packaging steel whether certain ideas for material reduction can also be implemented in practice,” explains Ioana Weinand. She has actively shaped the development of FEM at thyssenkrupp Steel in various roles from the very beginning. In her previous job as an engineer at the site in Dortmund, the 32-year-old was part of a cross-company transfer program that focused on research into new development processes in the area of packaging steel. At thyssenkrupp Rasselstein in Andernach, she is now seamlessly continuing her work as part of a highly specialized team that aims to shape an entire industry with the finite element method.

Dr. Manuel Köhl: “We will therefore devote even more attention to the topic of FEM in the future, because we want to be at the forefront of the further development of this innovative technology. Soon it will be impossible to imagine life without the finite element method.” The fact that the importance of FEM is increasing is also due to its versatile application possibilities. Already today, the virtual method can be applied to all can types and components. This includes aerosol can lids and bases, as well as can screw tinplate caps or crown caps. Fabian Knieps, who works as a doctoral student in development at thyssenkrupp Rasselstein, sees additional opportunities for industry here: “FEM makes it possible to implement completely new product ideas and thus promotes innovation in the packaging industry. Manufacturers can be more daring and come up with more creative solutions.”

Virtual methods strengthen customer loyalty

Trivium Packaging, a global leader in the manufacture of tinplate packaging, sees FEM as a great opportunity for virtual product and process simulation. “Virtual simulations like FEM can increase the efficiency of our product development and provide the market with better packaging solutions,” said Jean-Luc Keravec, Vice President Group R&D, Trivium. “The material description Rasselstein provided for the FEM was critical. This project shows: by bringing together open-minded and passionate people



Creative mind: Fabian Knieps is writing his doctoral thesis on the Finite Element Method (FEM) at thyssenkrupp Rasselstein.



with the appropriate skills, real progress can be made, benefiting both people and the planet. Rasselstein has proven to be a partner that listens, speaks the same technical language and shares our passion for innovation.”

But other companies in the tinplate packaging value chain, such as MAIKO Engineering from Braunschweig, also see the advantages of the method. “For us toolmakers, virtual methods represent an opportunity to optimize our products. Here, we rely on close cooperation with thyssenkrupp Rasselstein and complement

one another. For example, in a joint project we were able to analyze various forming processes in detail using optical measurement methods. This helps us to better understand the processes and accelerates process and product development,” explains Marco Hein, Managing Director of MAIKO Engineering.

Web

Here you can find more information about the Finite Element Method:
www.thyssenkrupp-steel.com/en/fem

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Central building block for a sustainable future

With the new hot-dip coating line (FBA) 10, thyssenkrupp Steel is investing further in the production of high-quality hot-dip galvanized flat steel grades with the best surface finishes. The **automotive industry** in particular will benefit from this.

Copy Jan Ritterbach





FBA 10: Production facts

Dimensions:

In the FBA 10, strip widths from 950 to 1850 millimeters can be produced. The available thicknesses range from 0.5 to 2.3 millimeters, and the maximum coil weight is up to 36 tonnes.

Galvanization:

The FBA 10 supplies high-quality zinc coatings for all interior and exterior skin parts, also in primetex® quality. In addition, pure zinc and zinc-magnesium coatings (ZM Ecoprotect®) of the highest quality are available.

Finishing:

A modern quarto skin pass mill with state-of-the-art high-pressure cleaning for work and back-up rolls with integrated flatness measuring roller fulfills high demands regarding surface roughness and evenness. The strip inspection stand offers ideally illuminated horizontal and vertical observation and grinding sections. The electrostatic oiling machine is designed for second generation prelubes.

3 50 meters long, 65 meters high and 37 meters wide: With the new FBA 10 at the Dortmund site, thyssenkrupp Steel has literally created something big. The line, the test and ramp-up phase of which will begin in summer, not only underlines 40 years of industrial expertise in hot-dip coating. As one of the world's most advanced lines of its kind, it is also a major milestone in the company's future strategic alignment.

An impressive 8000 tonnes of steel and 24,000 cubic meters of concrete were used for the new highly modern plant of the production network, which in the future will coat up to 600,000 tonnes of material per year. This will create substantial additional capacities for hot-dip galvanized products at thyssenkrupp Steel. Specifically, the products involve a wide range of grades from almost all strength classes. From soft deep-drawing steels to ultra-high-strength multiphase steels.

Setting market trends with high-tech

The target group is primarily the automotive industry, whose demand for hot-dip galvanized outer skin and structural components continues to grow. This trend is mainly explained by the fact that for many OEMs, hot-dip galvanizing offers economical cathodic corrosion protection for their vehicles, with a uniformly coated outer skin that is easy to process. ➤





Accompanying the FBA 10 approval process (from left): Peter Paul Masarczyk (Technical Customer Service), Folke Redam (Head of Quality), Clemens Trachternach (Team Leader FBA10) and Volker Smukala (Product Management Surface Finished Products).

“In the automotive industry, there is a substantial shift from electrolytically galvanized to hot-dip galvanized steels,” says Volker Smukala from Surface Finished Products Product Management at thyssenkrupp Steel. “With the new hot-dip coating line, we are meeting our clients’ requirements, and exploiting the corresponding market potential. The line is a key building block in our approach to differentiate ourselves from the competition through high-tech products.”

FBA 10: State-of-the-art

Because high-tech materials require high-tech production, the FBA 10 represents the latest state-of-the-art. State-of-the-art in all areas. “For example, in furnace technology, where the use of regenerative burners with the best firing efficiency currently available ensures significant CO₂ reductions,” says FBA 10 team leader Clemens Trachternach. Waste heat can also be used even more efficiently in the new FBA 10, which is expected to have a lifetime of around 50 years. “This helps to further reduce energy consumption in the production process.”

The hot-dip coating line FBA 10 currently under construction is state-of-the-art and will supply the automotive industry with high-quality zinc coatings for all interior and exterior skin panels.



Senior engineer Folke Redam, responsible for quality at FBA 10, adds: “The latest measurement, control and regulation technology, new nozzle technology, sensors and cameras additionally ensure the highest quality standards.”

Compatible with new steel grades with less CO₂

All of this ensures that thyssenkrupp Steel can manufacture products on the line that could not be offered easily before: for example, products refined with zinc-magnesium having special dimensions of up to 1850 mm wide for automotive customers. This takes into account the trend that more and more vehicles – especially electrically powered models – are being built as SUVs with high side panels to make room for the large battery boxes. There are also safety aspects: “To protect pedestrians, modern designs consist of wide, impact-absorbing engine covers. This is because it effectively moves the less compliant boundaries between the engine cover and the wing out of the area of the head impact,” explains Peter Paul Masarczyk, Head of Sales and Engineering, thyssenkrupp Steel.

Important in terms of greater sustainability and recycling management: In the future, the new line will also be able to process steels with increased recycled content to produce high-quality zinc or zinc-magnesium products. Thanks to the low application thickness and the resulting reduced zinc content, these products can help customers in the automotive sector to save materials and costs – and thus also to operate more sustainably overall.

Web

More information about the FBA 10 investment can be found here:
www.thyssenkrupp-steel.com/en/investments

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Digital and efficient

New slab storage facility at thyssenkrupp in Duisburg

In the context of its 20-30 strategy, thyssenkrupp Steel ordered a fully automated central slab storage facility from Italian plant constructor Danieli & C. Officine Meccaniche, for a sum in the tens of millions. The most significant special feature of this project is its intelligent logistics control. This enables the real-time synchronization of around 1.7 million tonnes of slab per year, therefore representing an efficient process flow with a positive effect on performance. Some of this is used directly from the continuous casting line in the new hot-strip mill 4, or also fed from the new walking beam furnaces. In addition, there are plans for the installation of a warehouse management system which calculates the distribution of the slabs from various sources in real time and optimizes all crane movements.

In addition to the optimum usage of the 19,200 square meter slab storage facility, another advantage lies in improved operational safety, as there will in future be no need for personnel on the ground. The Danieli company is providing four fully automated slab cranes and taking on the construction and installation of the entire steel structure. Completion is scheduled in two phases: In the first phase, four cranes and crane runways will be commissioned by the end of 2022/beginning of 2023. In the second phase the entire storage facility, including two holding furnaces, will be commissioned by the middle of 2023.

Smart weightlifter: Production processes will be synchronized in an innovative way



Sustainably finished

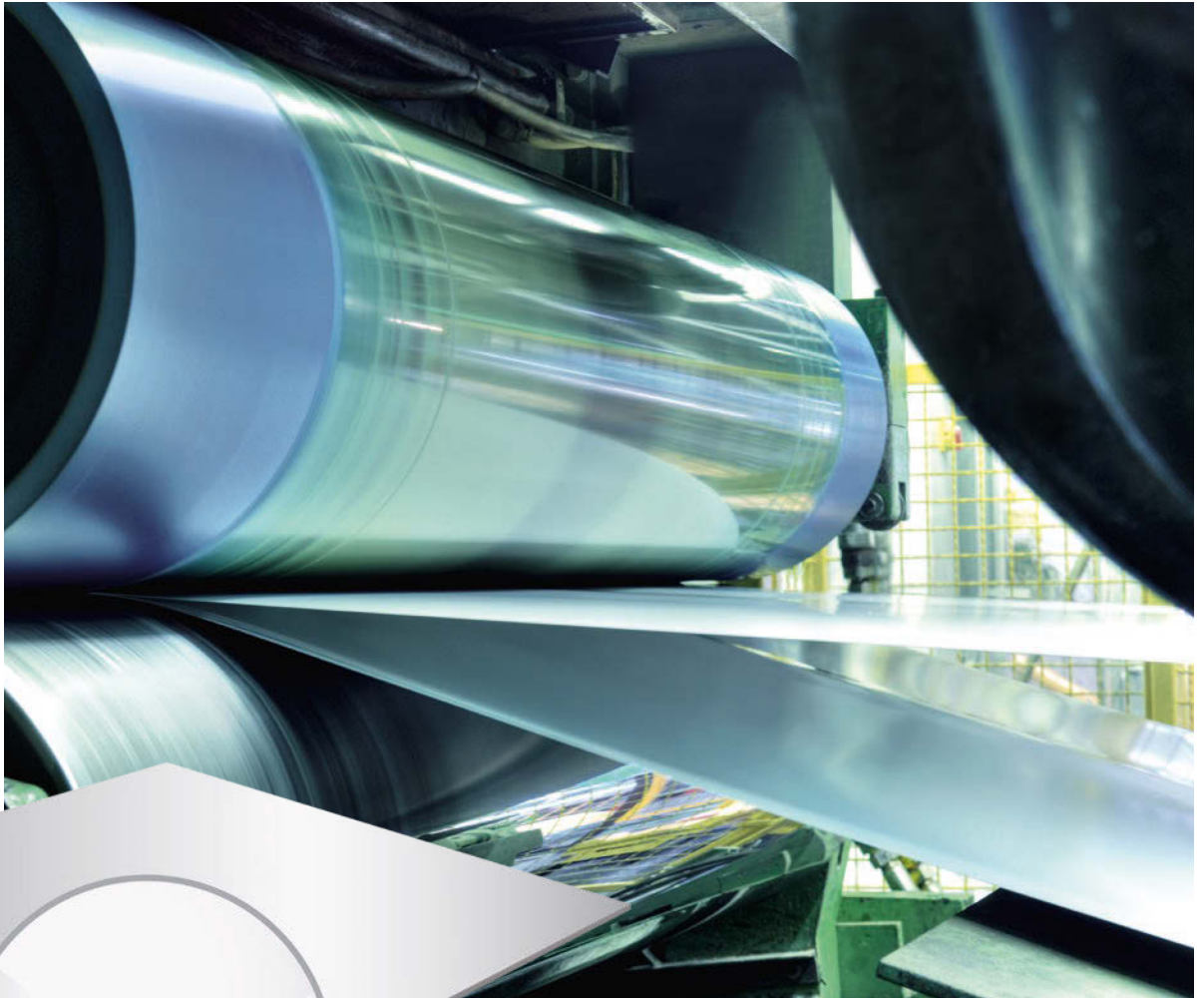
Innovative production of packaging steel

Material for customers will be produced on finishing line 13 from the middle of 2022.

An ultra-modern finishing plant for packaging steel is currently being created at thyssenkrupp Rasselstein in Andernach, in the form of the VA 13. From the middle of 2022, tin mill strip will be specially chromium-coated there in an innovative process. The new coating technology by the name of Trivalent Chromium Coating Technology (TCCT®) is based on chromium(III), replacing the previously usual chromium(VI). With it the company will shortly be able to offer its customers a future-proof product for the manufacture of chromium-coated steel packaging, which complies with the requirements of the EU-REACH regulation. The quantities of this REACH-compliant, special chromium-coated packaging steel are to be gradually increased by means of the VA 13. At the same time, thyssenkrupp Rasselstein will reduce the production of ECCS with chromium(VI) at finishing plant 8 by the corresponding amount. The capacity for special chromium-coated packaging steel will remain the same in this period. Even before the end of 2023, VA 13 is to replace the current plant which manufactures ECCS. From that date our portfolio will only include special chromium-coated packaging steel which has been produced 100% free of chromium(VI).



With this capital investment in the hundreds of millions, thyssenkrupp Rasselstein is continuing to back sustainability, process efficiency, quality and competitiveness. At the same time, the measures for health and environmental protection can be further improved in this way.



The fact that modern electric vehicles run so quietly is also due to innovative materials such as bondal® CB40 from thyssenkrupp.

Still waters run deep

An **innovative material** from thyssenkrupp Steel is indispensable in reducing the noise of the electric driveline (eATS) for electric vehicles: bondal® CB40.

Copy Jan Ritterbach

Electric vehicles are the modern form of automotive understatement in the 21st century: they do not make a loud entrance and instead glide along the road almost as quiet as a whisper. The quietness is due in part to innovative damping concepts that do not even stop at the power electronics. This can be seen, for example, in what is called the inverter. This is a central component for every electric drive; it converts the direct current of the battery into alternating current for the drive motor. "What many people don't know is that – depending on the load condition – the inverter's pulse width modulation causes highly energetic and unpleasant noise emissions that are perceptible to the human ear," explains Oliver Kleinschmidt, head of product management for steel sandwich materials at thyssenkrupp Steel.

The annoying noise is radiated to the outside via the cover of the inverter housing and represents a considerable comfort problem with regard to the demanding clientele. Because this cannot be solved satisfactorily with conventional materials and without secondary acoustic measures, well-known brand manufacturers, for example, rely on material from thyssenkrupp Steel for the inverter covers of all-electric models: the sandwich material bondal® CB40.

Sandwich of plastic and steel

In bondal® CB40, the term “sandwich” refers to a steel-plastic-steel composite in which two steel sheets are bonded together by means of a thin viscoelastic plastic layer. “When subjected to structure-borne noise, the connection which has a low shear force allows the vibration energy to be converted into heat, thus effectively damping the structure-borne noise,” observes Kleinschmidt. In addition, bondal® CB40 offers very good airborne sound insulation. And precisely in the high-frequency range that is so relevant for electric vehicles. Unlike all other monolithic metal sheets, the performance of airborne sound insulation is not negatively affected by the forming of the component. “The noise gener-

bondal® CB40

The steel-polymer-steel composite bondal® CB40 is closely related to the steel sheet from thyssenkrupp Steel. For use in electric vehicles, bondal® CB40 has a broad property profile for minimizing disruptive noise in the area of the electric drive train. This makes the material particularly suitable for use in the inverter cover. The good formability, which is comparable to that of classic monolithic steel sheets, facilitates solutions made of bondal® CB40. With its problem-free recyclability, bondal® CB40 is, like all steel products, a particularly sustainable material.

ated in the inverter is thus effectively held back by the inverter cover made of bondal® CB40,” explains Kleinschmidt.

Efficiently shielding radiation

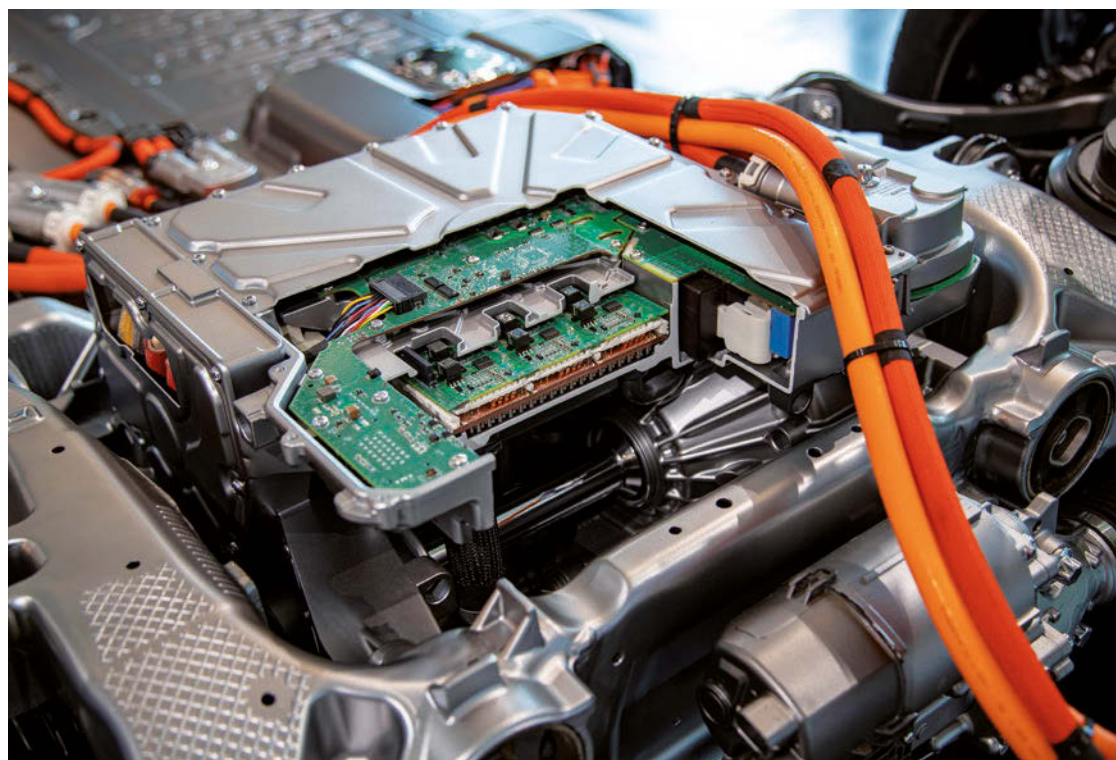
When selecting materials, electromagnetic shielding is also important for the automotive industry with regard to bondal® CB40. The engineers’ goal is to attenuate the electromagnetic field of the engine in such a way that no adverse health effects arise for the occupants of a vehicle. Oliver Kleinschmidt: “Due to its specific material characteristics, bondal® CB40 can ensure good magnetic shielding of the electric drive. On the one hand, this protects the vehicle’s passengers from electro-smog and, on the other, ensures the smooth functioning of the complex on-board electronics.”

Web

Here you can find more information about bondal® CB40:
www.thyssenkrupp.steel.com/werkstoffverbund

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Less is more: in electrically powered vehicles, this applies not only to emissions of harmful greenhouse gases, but also to a significant reduction in the volume of drive noise thanks to inverter covers made of the sandwich material bondal® CB40.

Ultra-high-strength steels of the next generation

Advanced High Strength Steels, or AHSS for short, have been a fixture in the automotive industry for several years. In particular, they stand for added safety and efficiency in the vehicle body. To help shape the next generation of **modern AHSS**, thyssenkrupp Steel is cooperating closely in development with the Japanese steel manufacturer JFE Steel Corporation.

Copy Jan Ritterbach

Modern design and functional requirements sometimes lead to more complex component geometries in automotive design. At the same time, lightweight construction is demanding ever higher strengths in car bodies. This conflict of objectives consequently requires cold-rolled steels that are both particularly strong and particularly easy to form. Two attributes that have so far been difficult to reconcile, however, as Dr. Patrick Kuhn, Product Manager in Automotive Sales at thyssenkrupp Steel, knows: "Strength and ductility are initially diametrically opposed things. After all, the stronger a steel is, the more challenging it is to shape. For use in modern vehicles, however, it is precisely the combination of high strength and good formability that is essential."

Successful combination: For use in modern vehicles, the mix of high strength and good formability is essential. Dr. Richard Thiessen (right) and Dr. Patrick Kuhn see modern AHSS as being far out in front, especially in crash-relevant vehicle components.



thyssenkrupp Steel already offers its customers in the automotive sector a broad portfolio of advanced multiphase steels with extended degrees of freedom for the design, layout and processing of components. And the steel development is already continuing. Together with its Japanese partner JFE, thyssenkrupp Steel is now opening the new chapter in the next generation of AHSS grades.

Innovative process for new steel grades

The key lies in a special manufacturing process that deviates from conventional production methods. Based on the joint expertise of JFE and thyssenkrupp Steel, the steels are subjected to special heat treatment in the continuous furnaces. The result is new steel grades with pronounced local formability that have tensile strengths of 980 and 1180 MPa, says Dr. Richard Thiessen, responsible for multiphase steels in the innovation area. "Thanks to their material structure and the targeted matching of phase constituents, these grades combine both good forming properties and high yield strengths for crash safety."

Material for the next generation of vehicles

These new-generation grades can bring their special property combinations to bear, particularly in lightweight construction concepts and crash-relevant structural components. "Target applications are primarily cold-formed elements in impact areas," explains Patrick Kuhn. These include, for example, side members, sills and A and B-pillar applications.

Important: The new steels are being designed specifically for the next generation of vehicles. This includes battery-powered electric vehicles in particular. And the research continues. Kuhn: "JFE and thyssenkrupp Steel will soon focus their joint research and development work on even higher tensile strengths."

Web

Here's more on the next generation of modern AHSS:
www.thyssenkrupp-steel.com/en/ahss

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Knowledge from the web

To keep customers informed about new processes, materials and applications, thyssenkrupp Steel offers compact **online seminars** for further technical training. Individual and international.

Copy Jan Ritterbach

It's no different in the steel industry than in other sectors – if you have a quick line to your customers. However, because specific materials and their applications require more explanation to customers than services and everyday products, the steel manufacturer has established individual formats for its customers.

All online seminars customized

The interactive online seminars in the inside automotive steel series have proved very successful. Communications Manager Britta Sondermann is an expert in communicating topics with a high degree of technical complexity and coordinates the sophisticated information offerings for customers from the automotive industry. She describes her current challenge this way: "Today, virtual customer events, on-site presence formats and hybrid event forms have to be combined in such a way that they complement each other perfectly and our customers always benefit from a tailored information offering – also and especially against the background of the international positioning of automotive manufacturers."

This is particularly evident in the virtual online seminars that customers from all over the world join.

Together with the materials and technology experts from the specialist departments, she streams the events from thyssenkrupp's in-house studio. "Thanks to our many years of expertise, especially for automotive topics, we can



Britta Sondermann, responsible for sales projects at thyssenkrupp Steel, is pleased with the good response to the new online seminars on the topics of hot forming, cold forming and electric mobility.

draw on a large number of proven expert speakers who then set the desired focus, depending on the target group," explains Sondermann. Because at thyssenkrupp Steel, no online seminar comes off the peg – each event is tailored to the wishes of the participating guests.

Automotive industry appreciates new format

Customers from the automotive industry have taken a liking to the new possibilities. They appreciate being able to share and discuss their own product-specific challenges directly with thyssenkrupp Steel experts in a small group. Sondermann: "The feedback has been very positive. For example, a customer will be using the recording of the online seminar for internal training purposes in the future. Others now want a regular rotation to keep the exchange alive. This encourages us to continue on our chosen path and further expand our offering."

Online Seminars – facts:

Hot forming, cold forming, lightweight steel construction for electric mobility, and bluermint® steel, these are the current online seminars. As a rule, the digital events are designed for a duration of 120 minutes and are held in German or – for an international audience – in English. The circle of participants is broad and ranges from technicians and design engineers to decision-makers from purchasing. If you are interested in an online seminar, please contact your Sales Automotive contact person or Britta Sondermann.

Web

More info about the online seminars:
www.thyssenkrupp-steel.com/en/web_seminar

Contact

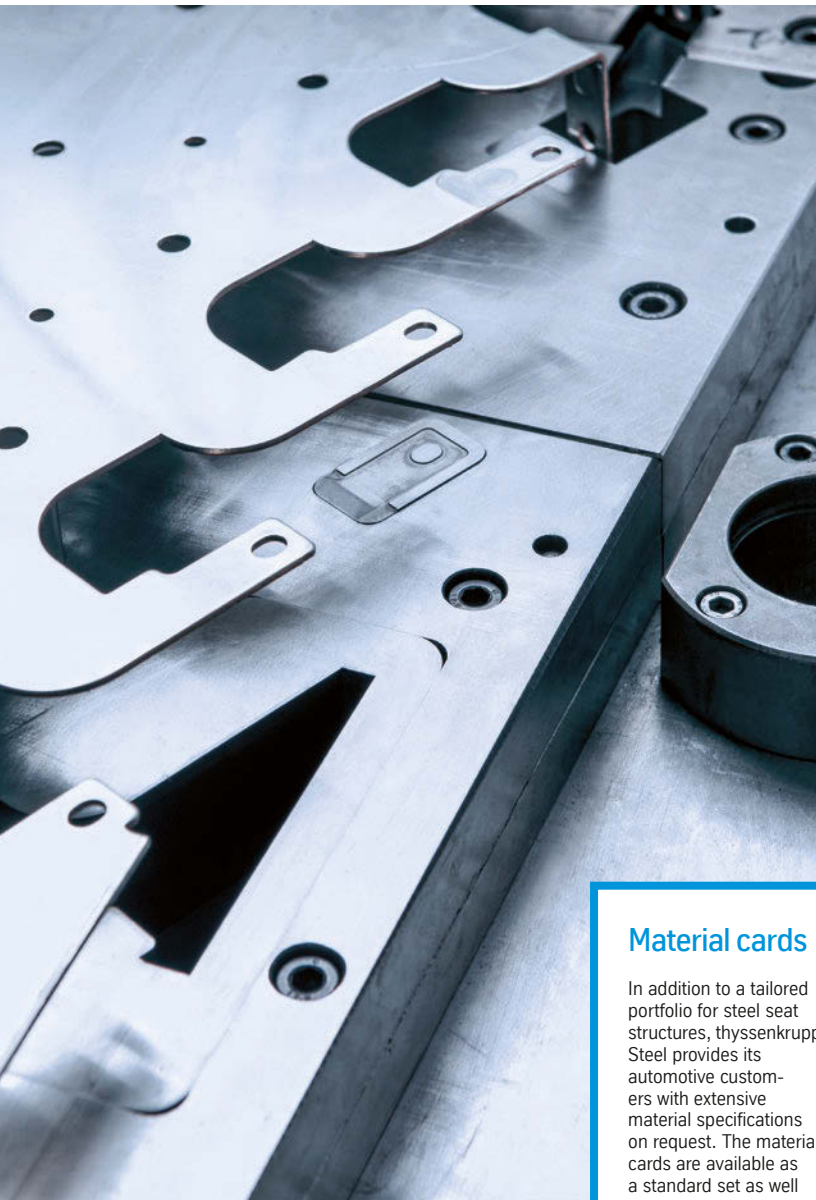
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Everything on the cards

Every second new car contains a vehicle component from Brose. The portfolio also includes seat components and structures, for which the successful family company sources hot-rolled microalloyed steels from thyssenkrupp Steel. In a joint development project and with the support of the supply chain expertise of thyssenkrupp Materials Processing Europe, the partners have now developed various grades of the scalur® product family and have presented the results in **material cards**.

Copy Katja Marx



Material cards

In addition to a tailored portfolio for steel seat structures, thyssenkrupp Steel provides its automotive customers with extensive material specifications on request. The material cards are available as a standard set as well as a complex material card with implemented fracture model.

The pickled scalur® hot-rolled strip falls below the usual thickness tolerances. This allows users to reduce the order thickness and lower the material weight, especially when using higher-strength steel grades. At the same time, the steel

has excellent forming properties and a quality comparable to that of cold-rolled strip. “scalur® opens up the possibility of using hot-rolled strip where cold-rolled strip was previously used,

without sacrificing comfort or safety,” says Gerald Erdmann from Brose’s Materials Technology department. “Another decisive factor in our choice was that the material met our specific material requirements.”



Brose engineer Gerald Erdmann benefits from the new material cards during component development.

Simulating an emergency situation

But how does the material behave in the event of a crash? And what about the forming procedure? Reliable characterization of the material properties in advance of the application is central to

Brose. In cooperation with the Application Technology department of thyssenkrupp Steel and the Mannheim site of the Group’s own service centers of thyssenkrupp Materials Processing Europe, a set of material parameters was developed for this purpose.

Enrico Thiele, Brose Key Account Manager at thyssenkrupp Materials Processing Europe, together with Achim Peuster, Technical Manager at thyssenkrupp Steel, ensured that the specific requirements of the automotive supplier

were met, in close coordination with the customer. This was based on various experimental investigations to determine the characteristic values and subsequent simulations for validation. "Among other things, our real-life tests used high-tech testing machines that deliver reliable results even for high strengths," says Achim Peuster. In the next step, the experts selected the appropriate mathematical models to simulate the material properties in various programs.

Up to now, thyssenkrupp Steel has prepared the material characteristic values of hot-rolled steels mainly as a standard data set for simple simulations. "Together with Brose, we have now developed complex material cards of selected scalur® grades from S315MC to S700MC for numerical simulation for the first time," explains Achim Peuster. Included, for example, are the mechanical-technological characteristic values from tensile and fracture specimens, supplemented by extensive plasticity and failure descriptions. Advantage for Brose: With the help of the higher-quality complex data, the seat manufacturer can tell at an early stage of development whether the geometry of a component will withstand the load requirements.

Conserve valuable resources

The joint development work took six months. Both sides are satisfied with the result. "The material cards represent the properties of scalur® and allow us to take them into account in the simulation of forming processes and load cases in advance of production," says Dominik Biniszewski, project engineer for simulation at Brose. Because every virtual simulation in the run-up to production not only saves valuable resources, but also a lot of time. For the just-in-time processes of the automotive industry, this and the assured material supply via the service centers of thyssenkrupp Materials Processing Europe are a decisive advantage.

Web

More info on steel seat structures can be found here:
www.thyssenkrupp-steel.com/lightweight-steel-seat-structures

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What the experts say



With our complex material cards, we support our customers in using the optimum material right from the development of the component."

Hartwig Rösen, thyssenkrupp Steel, expert in simulation methods



The material cards allow us to consider the properties of scalur® in the simulation of forming processes and load cases – in other words, in advance of production."

Dominik Biniszewski, Brose Fahrzeugteile SE & Co.KG,
 Project Engineer Simulation



Despite pandemic-related challenges, the project shows that cooperation between a wide range of specialist departments in a spirit of partnership can work very well – and that is the aim of our Materials as a Service strategy."

Enrico Thiele, thyssenkrupp Materials Processing Europe,
 Key Account Manager



The success of the project confirms how important and beneficial it is for all parties involved to work together in a spirit of partnership."

Achim Peuster, thyssenkrupp Steel, Technical Customer Support

Benchmark – Learning from the best

Through its own on-site benchmarking in application technology, thyssenkrupp Steel identifies current industry trends and provides **best-practice examples** for the advanced use of materials. Steel customers benefit from the pooled knowledge – a classic win-win situation.

Copy Jan Ritterbach

never guess. It is a capital mistake to theorize before one has data.” The quote from the famous English writer Sir Arthur Conan Doyle would be the perfect motto for the Benchmark team formed around graduate engineer Erik Hilfrich.

Based in the Duisburg Technical Center in the middle of the plant site, this thyssenkrupp Steel department was launched just two years ago and focuses on analyzing structural parts and their materials. “Our goal is to find out which materials and processes are currently in particular demand among companies and on the market,” Hilfrich explains. The results are used to review and optimize the company’s own offering and to further develop it in an application-specific manner. The approach is also known as requirements engineering or requirements management.

Materials under the microscope

Before thyssenkrupp Steel took over the direction of benchmarking independently in 2019, the job was done by various external service companies from which the required data had to be commissioned and purchased. Even then, the feedback from customers was positive. Now we have all the reins in our own hands and can align the engineering detective work according to our own standards. The focus is on automotive components. Chassis parts, electric motors, vehicle doors, but also structural elements are just a few of many possible examples. In the first step, these are measured, weighed and scanned in the application technology laboratories,

among other things, before they are then disassembled and put through their paces in detailed examinations.

The results obtained through benchmarking not only give the experts a more accurate picture of the market, but also help thyssenkrupp Steel’s developers gain a deeper understanding of specific requirement profiles. Especially when the company’s own materials competencies and analysis capabilities are linked within the steel group. Thus, the material steel is analyzed, evaluated and tested by internal experts in everything from chemistry to processing and specific applications. In the course of the



The team led by Helmut Mebus, Kai-Uwe Jentsch and Erik Hilfrich (from right) analyzes which materials are in particular demand and why. The knowledge gained is then incorporated into product development.

knowledge exchange, the Materials department then receives information from the Innovation department as to which strengths are currently determining the competition in chassis development. In this way, the benchmark professionals set important impulses across departments and throughout the company. In some cases, the investigations even lead to new, more suitable products being recommended to customers. For this purpose, the Application Technology department in Duisburg also conducts targeted workshops for customers – in these times, of course, taking into account all hygiene rules and the currently valid COVID protection regulations.

Workshops for active exchange

The interactive workshops are characterized by an inspiring atmosphere and follow a practical concept. Depending on the event, various components are presented in the specially equipped seminar area, which are analyzed together with the clients. Together, they can look at details and discuss best-practice solutions. An example of this is the use of new steel grades in vehicle structures, which opens up completely new possibilities for OEMs in view of the weight and safety challenges associated with electric mobility. “During the workshops, we quickly get into a very fruitful exchange with our contacts about the pros and cons of solutions and can also very efficiently counter any reservations and fear of addressing certain topics,” says Kai-Uwe Jentsch, who is primarily responsible for



benchmarking in the department. The graduate engineer continues: “We’re pleased that companies that had previously avoided steel in certain series have returned to steel after the events.”

Service offer open to all

The benchmark workshops provide ample space away from the hustle and bustle of everyday business to highlight industry trends, share research results, and provide customers with application concepts geared to the future. In this way, individual challenges can be solved – such as reducing process costs in the manufacture of components or boosting performance. Graduate engineer Helmut Mebus: “Our benchmarking services are open to both internal specialist departments and our clients, and are missing nothing in terms of quality.” Also because the offer addresses the needs of companies in a holistic way. “We can optimize and develop components with both the right materials, innovative technologies and viable concepts.”

Try it out and touch it: At thyssenkrupp Steel’s interactive workshops, participants can experience new materials and their application in components at first hand



Web

Further information on the subject of benchmarks in application technology can be found here:
www.thyssenkrupp-steel.com/en/benchmark

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1

Back to the future

A warm welcome: the Volkswagen ID.4 arrives just in time for shooting through gate 6 to the Duisburg plant site. A special guest for thyssenkrupp Steel, because actually a good 2000 juggernauts, along with 13,000 vans and cars, enter and leave through the digitalized factory gates daily in a never-ending logistics stream, among other things for goods handling.

The age of electric mobility will be shaped to a large extent by steel, the material for modern drive units, assemblies and body elements. A striking example is the new ID.4 from Volkswagen. steel^{compact} took the sleek electric car to the place where the innovative materials are made: to the various locations of thyssenkrupp's production network.

Copy Jan Ritterbach

2

The first shooting-stop for the ID.4 is Duisburg's river terminal. This is where the ores and all the other raw materials thyssenkrupp Steel needs for steel production arrive by ship – around 60,000 tonnes a day.



3

This is where it all begins: In the port area, the ID.4 passes between the 300 meter long ore blending beds. Up to 25 different feedstocks are stored here before being prepared for the blast furnace process in the sintering plant. It is hard to believe that they will later go into the materials that are also used in the electric Volkswagen, among other things.

4

Melting: In the blast furnace, sinter, pellets, coke and other aggregates are melted into pig iron at around 1350 degrees Celsius – up to 30,000 tonnes a day are produced by the four blast furnaces in Duisburg.



5

Power meets precision: In the steelworks, pig iron is turned into liquid steel, which is cast into shape in continuous casting plants and cut into what are called slabs. These steel blocks weighing up to 50 metric tonnes, which corresponds to approx 25 ID.4.



6

Some like it hot: In the hot strip mill, the ID.4 is staged from a safe distance. Here, the slabs heated to around 1,200 degrees Celsius are rolled out with the help of rolling stands. The result is a 2 kilometer long steel strip that is wound into a roll: this is the coil.



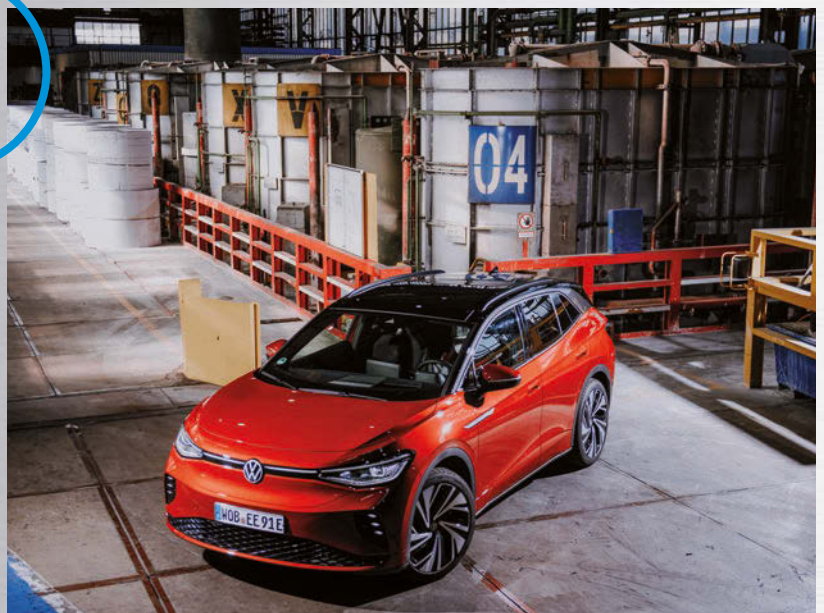
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Always runs on the right track: the ID.4 together with a coil train during delivery. Because for the automotive industry, the hot-rolled coils are processed further. First, they go to cold rolling. The steel passes through rolling stands and becomes thinner and longer – a strip can then be up to 5 kilometers long.



8

Could it be a batch furnace? No – but coils are processed into electrical steel in what is called the batch-type annealing furnace at the Gelsenkirchen site. This grain-oriented electrical steel of the powercore® brand is characterized by particularly low remagnetization losses and thus achieves high efficiencies in current conversion. It is essential for the production of efficient transformers, which are also found in charging points for electric cars – and which ultimately ensure that the battery of the VW ID.4 can be charged quickly and reliably.



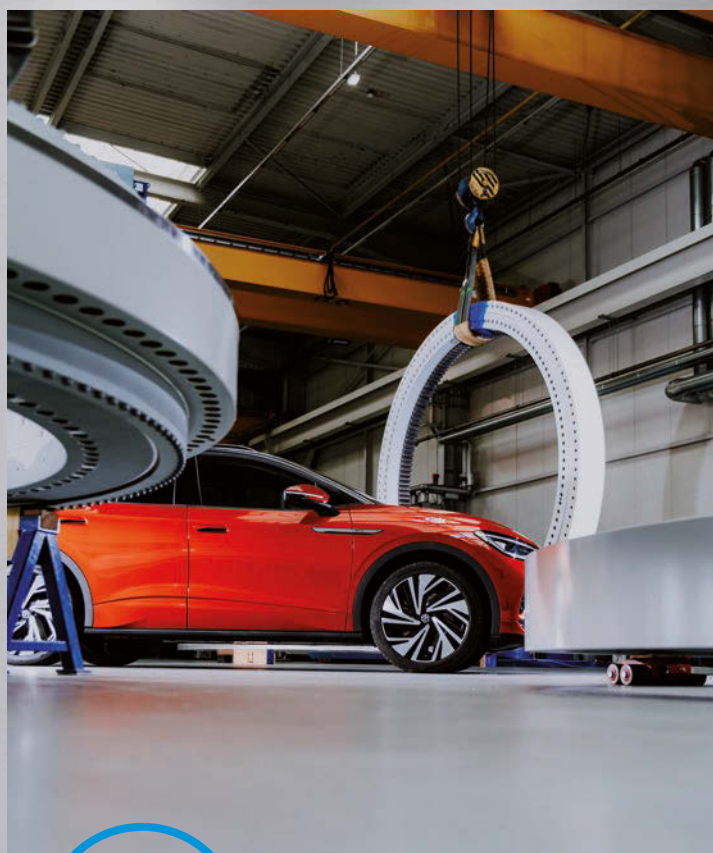


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High, higher, high-bay warehouse: At the Bochum site, on the other hand, non-grain-oriented electrical steel is waiting to be shipped to the customer. It is used for the production of highly efficient and powerful electric drives, such as those used in the ID.4. The powercore® Traction electric steel strips enable high ranges and maximum driving dynamics.

10

For the exterior values: In the hot-dip coating plant in Dortmund, the cold-rolled coils from Duisburg are finished to the highest surface quality for interior and exterior body parts. This includes pure zinc and zinc-magnesium coatings of the ZM Ecoprotect® brand.



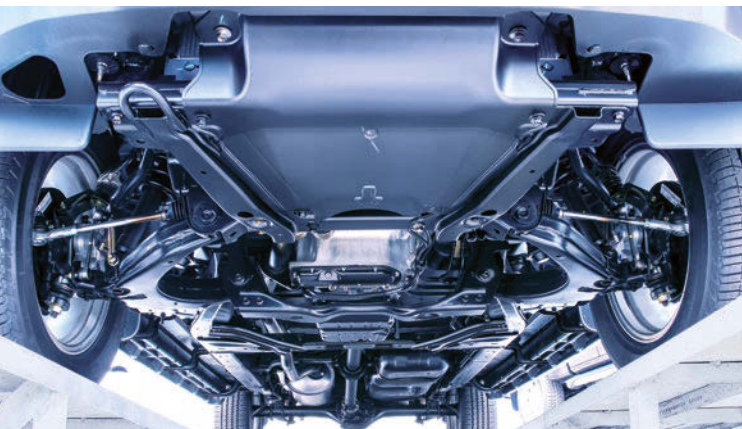
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Look to the future: Electrical steel strip is used in the manufacture of modern slewing bearings like at thyssenkrupp rothe erde in Dortmund. The bearings are installed in generators of the latest generation to produce the green electricity that the ID.4 needs for charging as efficiently as possible.

New microalloyed HD grades for automotive engineering

Due to their good processing behavior, hot-rolled microalloyed perform[®] steels have proven their worth in vehicle construction – especially in the areas of chassis and seats. The **new high-ductility (HD) grades** from thyssenkrupp Steel are particularly convincing in this respect, with a uniform property profile tailored to the intended use. And this with increased forming potential at the same time. If the choice of material is right, the weight of the component can also be reduced.

Copy Editorial office



New HD steel: Application-oriented processing properties for economical component production in a reliable process

2

Processing

The special alloying of the new high-ductility microalloyed steel grades ensures stable mechanical properties – the best prerequisites for high production reliability. A high yield strength ratio gives the designer sufficient leeway in the design to prevent possible component failure due to overloading. Their very low carbon equivalents make microalloyed steels excellent for welding. Schreiber: “To make the best possible use of the potential of the new HD grades and predict forming and crash behavior by means of simulation, thyssenkrupp Steel provides extensive material parameters for selected hot-rolled steels.”

1

Portfolio

Whether in seat components such as underbody side parts and seat rails, in the axle or wheel suspension area: Component shapes are becoming increasingly complex and the demand for their dimensional accuracy is rising, while in parallel

the material strengths continue to increase. In short, the automotive industry is demanding improved material properties. thyssenkrupp Steel is responding to this need with new hot-rolled microalloyed HD grades. “Compared to the standard, they are characterized by a significantly narrower range of mechanical properties and have an increased elongation at break,” explains thyssenkrupp Steel product manager Arne Schreiber. The HD grades are available in accordance with DIN EN and VDA or in the scalur[®] product version, which scores points in practical use thanks to its extremely narrow tolerances and very flat thickness profile.

“

Best conditions for high production reliability.”

Arne Schreiber sees the new HD grades as ideal products for the high demands of the automotive industry.





3

Advantages at a glance

Improved cold formability for complex component geometries

Guaranteed narrower range of mechanical parameters compared to VDA 239-100 and DIN EN 10149-2

Significantly increased elongation at break

Lightweight potential through sheet thickness reduction

Narrowest thickness tolerances for hot-rolled wide strip, choice of graded tolerances or scalur®

Excellent surface quality

Reduction of production costs in the press shop thanks to application-specific property profile

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More about microalloyed HD grades:
www.thyssenkrupp-steel.com/en/perform-hd

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Cross-site testing of process quality

thyssenkrupp Steel is striving for optimization in all areas. For example, when it comes to making its own plants even more efficient.

Mr. Lohmeyer, how can research & development help to improve process quality in production plants?

In our R&D teams, for example in the chemical laboratories, we evaluate around 720,000 samples a year. A large part of these are tests for our own production plants. Over the decades, this has created a vast store of knowledge across all sites, which we intend to make greater use of in future for advising the plants. In a six-month pilot project, we therefore initially reviewed our nine hot-dip coating (FBA) lines together with colleagues from the plants and developed targeted improvement measures. The results are also incorporated into the control system of the new FBA 10, among other things to optimally adjust the cleaning and degreasing baths for our products and processes. For me, this is a perfect example of how intra-company cooperation improves process quality.



Niels Lohmeyer, Head of Innovation thyssenkrupp Steel



Karina Schuck, Head of Customer, Products, Quality thyssenkrupp Steel

Ms. Schuck, how do customers benefit from the internal quality campaign?

If a purchase order with its respective specifications is executed equally well and in accordance with the quality requirements by all plants, this makes us flexible in production. Flexibility and stable production processes shorten our lead times. This is a direct benefit for our customers. Overall, we are trying to harmonize the production processes on all comparable lines. The standardized tests performed by our central testing laboratories contribute to this harmonization.

Web

More information about quality management:
www.thyssenkrupp-steel.com/de/unternehmen/strategie-20-30/investitionen/investitionen.html

Contact

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