

compact steel

Issue 01/2016

The thyssenkrupp Steel customer magazine
thyssenkrupp-steel.com

E-Business

How digital communication with customers works

Automotive

BMW leads the way – the new MINI is made with ZM EcoProtect

Agenda

Stefan Eiden and Lutz Keßler present modular service portfolios

Innovations in steel

The engineers in thyssenkrupp's steel division are thinking ahead in terms of materials, coatings, and processing methods

engineering. tomorrow. together.



thyssenkrupp

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At your service – We lend automotive customers our expertise in the form of modular services



We innovate

engineering. tomorrow. together.

These three words summarize our brand promise. Each of our next three issues will focus on one of these three terms, in the order of the slogan, and illustrate exactly what it means for you, our customers.



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Good ol' home cooking

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The library's exterior strikes a fine balance between beauty and function, thanks to PATINAX®

Title: Dominik Asbach (2), Benje Mueller, Christina Hausler/Reiss Edition (4); Illustration: C3 Visual Lab



Dear readers,

Creating something that did not exist before is one of an engineer's most exciting tasks. Our employees did just that when they developed TRIBOND®. This composite material for hot forming is the first of its kind worldwide – it combines high strength and ductility in a single steel and opens up completely new prospects for application.

We introduce you to four of our engineers who develop new solutions for you each day, on both a large and a small scale, in the cover story. They put the word 'engineering,' which we consciously placed at the head of our new Group slogan, into practice. In doing so, they represent the roughly 1,600 specialists in our Steel division. Meanwhile, our infographic shows you which trailblazing innovations of the past few decades were dreamed up by our engineers. Many of these developments still influence the market to this day, and continue to offer our customers numerous opportunities.

At present, we are expanding our services for our automotive customers – we want to do an even better job of living up to our reputation as a reliable development partner. This issue's agenda discussion, which covers application technology in Dortmund, Germany, contains more information about our specially tailored service packages. We hope you enjoy reading about these interesting insights.

Sincerely,
Dr. Heribert R. Fischer
Director of Sales & Innovation





Navigating sharp curves on steel runners

Toni Eggert and Sascha Benecken's luge speeds down the curves of the ice-covered track at 120 km/h, gliding on runners made from thyssenkrupp steel. The special grade of steel used to make these runners is kept strictly confidential – to keep competing lugers from following suit. After all, luge is an extremely technical sport, one in which a thousandth of a second can mean the difference between victory and defeat.

Eggert and Benecken have been competing as a pair for five years, and thyssenkrupp has been providing them with strong support since 2014. This support comes from across the Group – various business areas of this Essen, Germany-based industrial corporation are represented on Eggert and Benecken's luge. The luge's runners and racing pod were made by thyssenkrupp Presta Camshafts, and its new, extremely light and stable carbon fiber cladding (introduced this season) was developed by thyssenkrupp TechCenter Carbon Composites in Dresden, Germany. In fact, nearly 80 percent of the materials used to make the luge came from thyssenkrupp. This cooperation has proven successful – last year, Eggert and Benecken won the luge World Cup riding on thyssenkrupp runners. Next on the agenda: winning gold at the 2018 Winter Olympics.

It's all in the mix

First of its kind worldwide – fully automated sintering in Duisburg

A new sinter test facility determines the most efficient and environmentally friendly way to use raw materials

Not all ore is created equal. This raw material is important in steel production – it plays a large role in determining the quality of the end product. In other words, the best ore makes for the best steel. To help regulate ore quality, thyssenkrupp has put an automated sinter test facility into operation in Duisburg. This facility is the first of its kind worldwide. Here, small batches are tested to determine the behavior of the raw material under conditions of mass production. The facility also measures emissions released during the sintering process, so that steel plant emissions can also be reduced later on.

Sintering is the process of mixing fine-grained iron ore with aggregates required for the blast furnace process (such as coke), heating it to high temperatures, and baking the product into large pieces. The resulting chunks of 'sinter cakes' are an important component in crude iron production. Employees at the test facility can define the ideal blend of components in the sinter cake within the shortest possible time. Moreover, detailed dust analysis lets employees identify which materials release the fewest emissions during sintering. As such, the test facility makes an important contribution to environmental protection in Duisburg and the surrounding area.

Light and stable cans

Tinplate A tin can and no can opener? No problem – reach for a can with a pull tab. They're popular for a reason. To keep their cans competitive, steel can manufacturers are seeking steel that's thinner than the material currently in use, yet just as stable. thyssenkrupp's tinplate specialist has developed just such a high-strength packaging steel, which also holds its own against (lighter) aluminum: SolidFlex.



1,000 crash tests

can be carried out annually at the Dortmund location from now on, thanks to modernization measures undertaken at the drop tower test bench last year. The new measuring technology added to the test bench lets employees examine the energy absorption behavior (or crash behavior) of structures with an even greater degree of precision.

Krefeld expands its quality spectrum

Investment A new spectral analysis device at the Steel Service Center in Krefeld, Germany, ensures an even greater degree of analytical precision. Spectral analysis involves examining the composition of material samples and analyzing the chemical properties of steel. Analysis covers elements such as chrome, manganese, silicon, phosphorus, micro-alloying elements, and, of late, nitrogen. The Steel Service Center has also invested in a new die cutter, grinder, and saw for material samples.

Photos: thyssenkrupp Steel Europe AG (3), Shutterstock



New point of contact: Marcus van Marwick is now responsible for Brand & Customer Communications

Change in marketing leadership

New addition Marcus van Marwick has served as the Head of Brand & Customer Communications for thyssenkrupp's Steel division since the beginning of the year. As such, he has become the new face of thyssenkrupp Steel for customers and stakeholders. His responsibilities include strategic orientation and communication regarding the new brand, in both print and online channels. He is also responsible for organizing trade fairs and other events. Van Marwick previously held similar positions at Opel and Toyota. He replaced Achim Stolle, who took over marketing coordination for Hoesch Hohenlimburg, thyssenkrupp's medium-wide strip specialist, at the beginning of the year. ■

Invest in energy to save on electricity

Resources The main goal of the energy transition is to use energy more efficiently. German industrial concerns have agreed to meet this goal by 2020. thyssenkrupp's Steel division has many years of experience in efficient energy use, and has created its own network for this purpose: Steel energy+. This network is meant to facilitate the exchange of knowledge within the Group. The steel manufacturer took numerous energy-saving measures, both minor and major in scope, over the past two fiscal years, and consequently saved around 600 gigawatt hours of energy. This roughly corresponds to the annual electricity consumption of a mid-size German city. ■

Creative ideas pay off

Once again, three forward-looking projects were recognized in the Steel Innovation Contest

Steel bestows its annual Steel Tomorrow Award to innovations implemented within the company. These innovations can be improved processes, services, or business models as well as new projects and technologies. The most important criterion: proximity to customers.

This year's winners were all recognized for innovative products. First place in the 2015 competition went to the Heavy Plate business unit, for introducing the high-strength fine-grained structural steel XABO® 1300 to the market. This product was developed for modern lightweight designs, used in applications such as crane manufacturing.

Second place went to the tinplate manufacturers thyssenkrupp Rasselstein,

for their low earing packaging steel. They succeeded in optimizing very thin, high-quality tinplate for screw caps to such an extent that it no longer develops protrusions during the deep drawing process. This outstanding feat of engineering gives this special product a unique selling point.

Third place went to the team behind PLADUR® Relief family. This is a ZM EcoProtect sheet to which various paints can be applied by means of a special print rolling technology. Once it has been coated, this steel can look like high-quality wood, slate, or ice crystal.

For more information about the winners, see www.thyssenkrupp-steel.com.



Soaring high: XABO® 1300, one of this year's winners, is suitable for making mobile cranes.

440 km

– that's how long a **new liquefied natural gas pipeline** in Texas extends. The piping was made in Turkey using steel from our Duisburg location. thyssenkrupp Mannesmann employees delivered the material.

Working with an innovative spirit

engineering. tomorrow. together.

Engineering is key to making thyssenkrupp's brand promise a reality. The best way to understand what 'engineering' means for us and our customers is to take a look at the work of our engineers. They develop the solutions that we use to create competitive products.

Text Judy Born

You have most likely noticed that thyssenkrupp introduced a new brand a few months ago. The way the Group name is spelled, the Group color, and the logo have all changed in clearly visible ways. However, the new slogan – 'engineering. tomorrow. together' – represents a more complex shift at a deeper level. After all, there is far more to a brand than appearances alone. Our new brand represents a promise to keep our customers ahead of the curve.

Our solution-oriented engineering innovations make this possible. It is not for nothing that 'engineering' is the first term in our new slogan – it is the backbone of our Steel division and a key component of our Group identity. Our employees approach their work from an engineering perspective, bearing applications in mind. We are always concerned with providing our customers with the best quality, in a timely fashion and at excellent value for their money.

Our engineering accomplishments include Europe's first casting-rolling mill for flat carbon steel, which continually, in a single process and at an even temperature, rolls liquid steel into a hot-rolled strip. This method guarantees the highest level of quality. Another of our achievements is our blast furnace, which has been producing crude iron in an absolutely reliable manner for decades – day by day, around the clock, at temperatures above 1,500 degrees Celsius. Finally, the thyssenkrupp Steel division offers 1,800 individual grades of steel and 2,000 alloy concepts, and registers numerous inventions and patents each year, including TRIBOND® – and many more.

There are currently around 7.3 billion people living on Earth. According to a United Nations forecast, this number will climb to 8.6 billion by 2030. This increase roughly corresponds to the total population of present-day India. The past few decades have already seen the introduction of global initiatives to counter the consequences of extreme population growth. We must continue to uphold these initiatives – namely, resource conservation and environmental and climate protection. Issues of urbanization and mobility are also becoming increasingly important, given the rapid advances being made in the development of society.

This is where engineering expertise plays a crucial role. Engineers can create lightweight construction solutions for cars, design concepts for wind turbines, and innovative infrastructure projects, to name but a few of their proficiencies. Our engineers focus on processes and applications for steel that are in keeping with the times. Their professional expertise stems from their many years of experience, as well as from their innovative spirit – after all, there is a creatively minded person behind every invention. Our engineers' ideas and specialist expertise are the driving forces behind our developments in steel. Naturally, we also take market trends and customer needs into account.

Four engineers You will get to know four employees behind our company's latest developments on the following pages. They represent the many dedicated specialists in thyssenkrupp's Steel division.

A portrait of Stefan Myslowicki, a man with dark hair and glasses, wearing a blue blazer over a white shirt. He is standing in front of a green background with some blurred lights.

1 Stefan Myslowicki

Age 44

Fields Process development and pilot production

Products TRIBOND® 1200 and TRIBOND® 1400

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What is TRIBOND®?

Generally speaking, TRIBOND® is a composite produced by hot-rolled cladding that combines various different grades of steel in a single material, resulting in a new characteristics profile.

What is special about TRIBOND® 1200 and TRIBOND® 1400?

Their composition. They were specially developed for hot forming and consist of two outer layers of ductile steel surrounding a high-strength steel core. This three-layer composite structure ensures high levels of both strength and formability. As a result, hot-formed components can be made thinner and lighter. An additional advantage: Customers can process TRIBOND® in their existing facilities.

What role do you play in the development process?

I am the Project Manager for TRIBOND®. I scheduled the product from the beginning and supported its development. My duties include organizational tasks, developing test programs, and tracking tests in the lab and, later on, in operation. After the initial tests are conducted in our pilot production facility in Dortmund, Germany, we proceed to a test run in the hot strip plant. After that, the material undergoes testing in the cold strip mill and at the surface treatment plant.

What was the career path that led you to this position?

I earned a bachelor's degree in Metallurgy and Materials Technology from RWTH Aachen University, and went on to earn my doctorate there as well. After finishing my studies, I started working for a heater manufacturer. I've been working for thyssenkrupp's Steel division for about eight years, and I primarily focus on TRIBOND®. Working on TRIBOND® gives me the opportunity to help shape the industrial-scale production of an entirely new group of steel materials from the very beginning.

Where will this new thyssenkrupp product be used?

Primarily in the automotive industry. TRIBOND® 1400 offers very high strength and ductility, which makes it the perfect material for components that need to have a high resistance to deformation, such as B-pillars. TRIBOND® 1200 is less strong, but more pliable. It is therefore suitable for components in the axial structure, since it does a good job of absorbing energy in crashes – it provides vehicle passengers with excellent protection in the case of an accident.

2 Sebastian Sieron

Age 30

Field Non-oriented electrical steel research and development

Products PowerCore® 260-27AP, 270-27AP, and 280-30AP

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What is non-oriented electrical steel?

Non-oriented electrical steel is a magnetically soft steel that serves as the iron core of electric machines, consolidating the magnetic flux. It boosts motor performance and efficiency in devices ranging from kitchen blenders to wind turbines.

What special features do the new grades of PowerCore® have?

These new grades have specially tailored structures – they were specifically developed for very high-speed applications. For example, automotive manufacturing customers request the smallest possible high-performance electric motors in order to guarantee the necessary vehicle range. We also successfully reduced further processing influences that had a negative effect on the punching process.

What role do you play in the development process?

I'm responsible for the technical side of product development. I started by conducting all of the operational and lab tests. I then evaluated the results and presented them internally to the Auto team. This team consists of representatives from Application Technology, Technical Customer Support, Sales, and Product Development.

What was the career path that led you to this position?

I studied Electrical Engineering at Bochum University of Applied Sciences, and then I worked at a company in the wind energy industry. I've been working for thyssenkrupp's Steel division here in Bochum, Germany, for four years, in the Research and Development department. I've been passionate about science since I was very young, and my current job gives me the opportunity to pursue that passion.

Where will this innovative electrical steel be used?

In widely varying applications. We are selling a flat product – it does not become a component until a later stage. In other words, electrical steel virtually always undergoes further processing. The material that we are currently discussing was primarily developed for very high-speed drives used in vehicle traction, hybrid, and electric drives. As such, it plays a decisive role in making electromobility more sustainable in terms of energy use as well as more environmentally friendly.



3 Jenny Schulte

Age 36

Fields Product services and technical customer support

Product SCALUR®+Z

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What is SCALUR®+Z?

SCALUR®+Z is a hot-dip galvanized flat product that is perfectly suited for rollforming processes and lets customers save on materials, time, and money.

What is special about SCALUR®+Z?

thyssenkrupp can guarantee a thickness tolerance of up to ± 0.06 millimeters for this material. This is a boon to customers, who benefit from a material with a constant thickness tolerance that lies significantly beneath the standard limit. This material's strict tolerances also allow for more strip per coil and reduced component weight. Moreover, the production process does not require retooling as frequently as processes for other materials do, which means that the customer experiences comparatively fewer standstills.

What role do you play in the development process?

I was already responsible for overseeing the hot-rolled material SCALUR®, so it makes sense that I was asked to oversee development and introduction for the fully galvanized version of that material, SCALUR®+Z. I monitored the initial tests together with my colleagues, and worked with the Product Strategy team to decide which grades would go with this new product. Now, I will oversee the initial rolling trials and support customers during the processing stage. When the product is ready to come onto the market, I will oversee the market introduction process. This will involve training the technical customer support staff who will support customers using this material.

What was the career path that led you to this position?

I studied Industrial Engineering and wrote my thesis at thyssenkrupp's hot-dip galvanizing line 1. Afterwards, I was offered a position at the company, and I stayed. That was about nine years ago now. Time has just flown by, thanks to diverse tasks and varied cooperation with customers and production.

Where will SCALUR®+Z be used?

In telescopic rails, for example, as well as in numerous stamped parts. SCALUR®+Z can also be used to make containers and electric motor housings. In the case of containers, the main advantage to using this material is its comparatively low weight – empty containers are now several kilos lighter.

“More room for creativity”

Germany’s powers of innovation can only be harnessed if both industrial concerns and the engineers working for them are prepared for change. An interview with [Ralph Appel](#), Executive Director of the Association of German Engineers (VDI).

Interview Judy Born

What challenges do engineers face today?

As a country with few natural resources, we will need to rely on our powers of innovation – or our innovative spirit, if you will – to an even greater extent in the future. Take, for example, Industry 4.0, a topic that is currently preoccupying all companies. Digital networking will cause production flows and business models to radically change. This will make the demands placed on engineers even more complex.

In what sense?

Expertise alone is no longer enough. Engineers need to expand their fundamental IT and software skills in order to understand how processes can work and be managed. It will also become increasingly necessary for them to work in an interdisciplinary manner. Their work in technical development can no longer be kept separate from the commercial side of things. In the future, engineers will need to have a more precise understanding of the economics involved.

So getting up to speed on digital developments is not enough?

No. It is equally important to look beyond the horizon of engineering. In the past, engineers, in the traditional sense of the term, fell into two categories. They were either electrical or electronic engineers, or they worked in steel, iron, or automotive manufacturing. Things have changed – primarily in the automotive industry, where the distinction between the two old engineering categories is increasingly blurring. Nowadays, when it comes to cars, electronics are just as important as mechanics are – if not more so.

An understanding of IT, an interdisciplinary approach... what else will companies need to emphasize?

The need for communication is growing. Both stakeholders (such as shareholders, employees, and customers) and the general public want, and need to be, more heavily involved. It is important to bring them on board at an early stage to ensure that new projects – particularly large ones – succeed. Companies need to take the interests of numerous, often differing groups into account, both those internally and those from outside.

So engineers need to focus more on external concerns?

Precisely. And they need work from this perspective starting in the early stages of development. They need to come together at an early stage and

seriously consider which versions of a project are the most technically and socially viable. The idea is to convince one another without having to resort to persuasion.

How does VDI prepare its members for the future?

We offer seminars on very specific topics for individuals, companies, and project sponsors. Our research employees give lectures at universities to raise awareness of important topics among the engineers of tomorrow. Our Knowledge Forum is a training academy where up to 30,000 engineers per year can learn about all kinds of technologies and soft skills. We provide them with valuable knowledge because it is clear to us that it is no longer sufficient to have gone to university. The digital transformation has shown us the need for life-long learning. And that is precisely what VDI supports.

How do you do that?

Well, for example, this year we are focusing primarily on the topic of Work 4.0 – working conditions are changing. We are also currently coordinating our educational content closely with that of the Fraunhofer Institute of Labor Economics and Organization in Stuttgart, Germany. We hold symposiums on key future issues for representatives from the fields of politics and business as well as members of the general public.

What kind of working environment should engineers have?

Engineers need more room for creativity. We do not necessarily need a German equivalent of Silicon Valley, but we should address the fact that many companies are still dominated by overly rigid work organization. Interdisciplinary work requires new working models and the willingness to make mistakes. Of course, this does not refer to the end product – I mean that we should allow for errors and false conclusions to arise during the developmental stages. That will take courage.

So companies need to adjust accordingly?

Absolutely. But this does not only apply to engineers. This is a broader issue of differences between generations. Generally speaking, we need up-to-date working models and fewer patriarchal structures. We need to make strides in that area if we want to maintain, or even enhance, Germany’s flexibility and powers of innovation.



Ralph Appel is the Executive Director of VDI Verein Deutscher Ingenieure e.V. and the Managing Director of VDI GmbH.

4 Stéphane Graff

Age 37

Field Forming simulation

Process Characterizing materials and conducting feasibility studies for hot forming

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What does simulation involve?

Simulations such as the ones we conduct for sheet metal hot forming can help us fundamentally predict how a steel will react during a hot forming process. In a simulation we virtually reproduce the individual process steps involved in making a component. Each simulation is based on data that describes the material. For example, you need to know what flow properties it has and how it will react under various load conditions and temperatures.

What is special about simulations?

Simulations allow us to answer many questions in the early phase of development. For example: Can we actually produce a component with the planned geometry? Is there a possibility that tears or wrinkles will form during the manufacturing process? If so, does the forming process need to be changed to prevent this from occurring? Simulations can answer all of these questions, and many more. You simulate until you find a solution. Then, you conduct a specific hardware test as part of prototype construction.

What role do you play in this process?

Simulation is based on data and models. When we want to conduct a feasibility analysis for a component, I need to start by preparing a reliable description of the materials. If I do a poor job of preparing this description, the entire evaluation of the forming process will usually be unreliable as well. We examine a material's characteristics internally or in cooperation with institutes and universities. When we put together feasibility analyses, we need to virtually construct, evaluate, and optimize the individual process steps. This applies for the analyses we provide for our customers as well as for the ones we conduct on internal development projects.

What was the career path that led you to this position?

I am a mechanic. I got my bachelor's degree in Mechanical Engineering and went on to earn a doctorate in that field. I have been working for thyssenkrupp's Steel division since 2007, where I primarily focus on sheet metal hot forming. This technology combines mechanics, thermal technology, materials science, and forming technology – that is what makes it so interesting to me.

Where is this process used?

This technology is primarily used in the automotive industry – for all components that need to be made, including hot-formed components. These include structural components that need to protect passengers in the event of a collision, such as A- and B-pillars and bumpers.

Ideal protection, simple processing

BMW is the first car manufacturer to use ZM EcoProtect from thyssenkrupp's Steel division in production – in the MINI's outer paneling.

Text Michael Schulz



From Mini to MINI – a cult car

The British Motor Company presented the first Mini with an 848 cc engine in April 1959. Its special feature: a 'mustache' grille. Many versions and decades later, this small car still enjoys cult status. MINI has belonged to the BMW brand portfolio since 2001. Despite its new, optimized interior concept and growing dimensions, it still has not lost its sweet miniature charm.

Frank Bosch of thyssenkrupp's Steel division is responsible for the BMW account: "ZM EcoProtect is a big deal for the MINI."

When Niki Lauda competed in the first motor race of his career in 1968 – and placed second – he was not yet sitting behind the wheel of a Ferrari. Back then, his car was the polar opposite of that souped-up luxury model from Maranello, Italy: It was a Mini. And for that little car, Lauda's second-place finish was by no means unusual. The 1960s was a successful decade for the Mini – it brought three different champions to a first-place finish in the world-famous Monte Carlo Rally. In addition to impressing on racetracks, it also graced the silver screen – alongside the legendary Michael Caine in *The Italian Job*, for instance.

That decade established this little car's large cult following. The fact that it is no longer truly British has not diminished its popularity in the slightest. On the contrary: Ever since BMW started making the MINI (now written in all caps), it has become a firm fixture on the streets of continental Europe. thyssenkrupp always rides along with the MINI – as of recently, the company's high-quality flat steel with ZM EcoProtect coating is included in the car's outer paneling. The MINI Hatch has ZM EcoProtect on its roof, and the MINI Clubman has it on its fenders.

Why did the Bavarian car manufacturer choose zinc-magnesium coating instead of conventional zinc coating? For Frank Bosch, the answer is obvious: "This new coating provides our vehicles' inner and outer paneling parts with many more advantages than conventional zinc coating does:

better processing, better corrosion protection, and a thinner zinc layer that lets us conserve resources." Bosch is the Key Account Manager for the thyssenkrupp Steel specialists in Duisburg. He oversees commercial and technical activities for the BMW Group account. "ZM EcoProtect is thinner than conventional coating, yet provides the same corrosion protection for the surface of the roof and fenders as conventional coating does. This new coating also does an

"Zinc-magnesium coatings set standards for both corrosion protection and processing."

Frank Bosch, Key Account Manager of BMW

even better job of protecting the highly vulnerable cut edges as well as areas vulnerable to stone chipping." Moreover, BMW was also impressed with ZM EcoProtect's improved processing characteristics. "These save costs at the pressing plant," says Bosch. "Minimized abrasion reduces the effort required for cleaning and extends the service life of the press." thyssenkrupp's Steel division is the first steel manufacturer in the world to put zinc-magnesium coating suitable for outer paneling into mass production – and eight months earlier than scheduled, at that. Maintaining a fast pace is also very important in the complex customer approval process. "We conduct a whole range of trials between the initial discussions with our customers and implementation – as was the case with this new roof and fender coating," says Bosch.

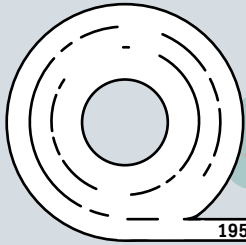
As a result, in order for implementation to succeed (as it did with the MINI), the customer needs to be involved in the introduction of the new product from the very beginning. The process goes quickly. That is hardly surprising – a fast pace suits the automotive industry well, particularly in the case of the speedy little MINI.

Many automotive manufacturers have caught on to the trend of zinc-magnesium surfaces – and many others are figuring out how and when they can switch to these surfaces, too.

Contact: Frank Bosch, Sales Automotive,
frank.bosch@thyssenkrupp.com



1955: Germany's first hot strip mill goes into operation at August Thyssen-Hütte a decade after the end of World War II.

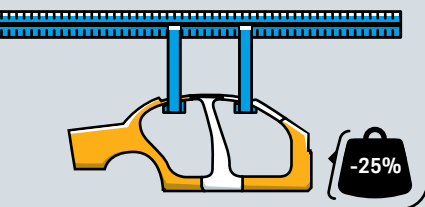


1950

1955

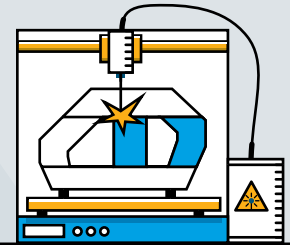
Steel continues to develop

From scrap iron to high-tech products – improvements in steel quality over the past century would not have been possible without thyssenkrupp.



1998

1993: Schwegern II, Europe's largest blast furnace, begins operation.



1983

1993

1990

1983

1998: The first casting-rolling mill begins operation.

1999: TAKO, a tandem mill combined with a pickling line, opens.

2002

2003

2007: Mass production begins on hotform blanks for hot forming.

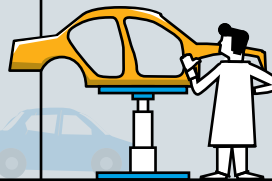
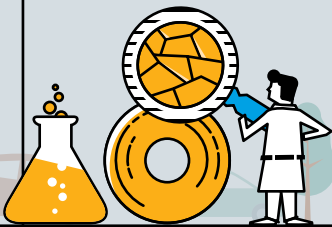
1998

1999

2000

2003

2007



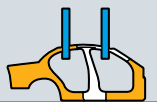
1983



Tailored blanks invented

For the first time ever, sheets of different types of steel were welded together with lasers in mass production. Later on, steels of different thicknesses and with different coatings were joined together as well. This enables certain parts of the blank to be imbued with certain characteristics, which in turn saves on weight and cuts costs. The business unit responsible for these activities was sold in 2013.

1998



Ultralight Steel Auto Body (ULSAB)

The international steel industry continually works to develop new, innovative solutions to ensure that automotive manufacturers keep choosing steel. The ULSAB program has resulted in the first lightweight car body made from multi-phase steels, and thyssenkrupp's Steel division played an active role in this development.

2002



Marketable, high-strength multi-phase steels

Modern, high-strength multi-phase steel development began in the 1980s – in 2002, it spread to the automotive industry. That year, various types of multi-phase steels with various properties were used in car bodies and chassis for the first time.

2003



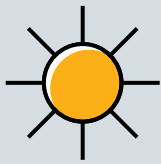
NewSteelBody (NSB) car body concept

thyssenkrupp's Steel division created its own lightweight steel construction concept for the first time, using the body in white of a real vehicle produced on a large scale as a benchmark. This concept, known as NewSteelBody (NSB), combined high-strength steels, weight-optimized tailored products, and a tube-intensive construction method, enabling a 24 percent reduction in weight.

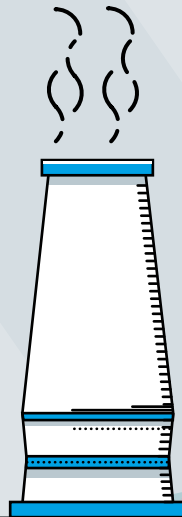
Pioneering work: The first hot-dip galvanizing line opens in Finnentrop, Germany. Here, zinc coatings are applied to strips.

The new, special finishes and coatings developed here will be used to make many premium products in the future.

1964



1970

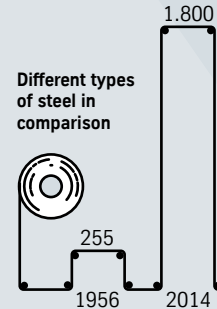


1973: Schwelgern I, the largest blast furnace in the Western world, begins operation.

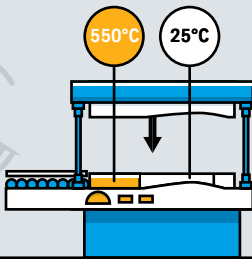
1980

1973

Different types of steel in comparison

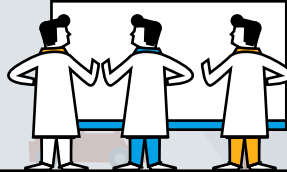


2012



2010

2012



2014



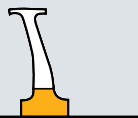
2014



2015

Ready for mass production: SCALUR®+Z
On the market: TRIBOND®
On the market: new types of PowerCore®-brand electrical steel

2012



Implementation of tailored tempering for production

This further development in hot forming technology makes it possible to manufacture components with locally varying elongation and strength properties in a single step. The secret behind this new technology: varying cooling speeds in different areas of the forming tool.

2014



InCar®plus: automotive manufacturing solutions

Building on 2009's InCar® development project, InCar®plus was a Group-wide effort that resulted in the development of more than 40 innovative solutions for drives, chassis and steering controls, and car bodies. These solutions were tested along the entire value chain and set standards for lightweight construction, electrification, energy efficiency, safety, and comfort.

2014



Zinc-magnesium coating

thyssenkrupp is the first steel manufacturer in the world to offer clients in the automotive industry mass-produced zinc-magnesium coating for visible outer paneling parts on car bodies. This coating, which provides highly effective corrosion protection, is called ZM EcoProtect®.

2014



Further development of composite materials

thyssenkrupp's Steel division has been developing hybrid materials since the 1960s. The first of these was BONDAL®, which consists of a vibration-reducing plastic layer sandwiched between two sheets of steel. The Steel division is currently working on developing LITECOR® and TRIBOND®. TRIBOND® is a composite material that consists of three layers of steel, while LITECOR® is a hybrid material that consists of a polymer core layered between two steel sheets.

A man in a light blue dress shirt and a patterned tie stands in an office with his arms crossed. He is wearing glasses and has a slight smile. The office has large windows in the background showing a cityscape. A desk with a computer monitor, keyboard, and mouse is visible to the right. A potted plant is on the desk. The overall lighting is bright and professional.

Moving away from paper

In thyssenkrupp's Steel division, digitization has been underway for years – it started with [SteelOnline](#). Today, all customers can manage their businesses quickly and directly.

Text Judy Born

Mr. Heitkamp, what is SteelOnline?

This platform is an information portal that customers can use to securely view their order and production statuses – around the clock, from anywhere in the world. It can also be personalized to include all relevant updates. Finally, customers can also download documents, such as invoices and quality certificates, from SteelOnline.

Is it similar to a shopping portal?

Yes, in a way. However, SteelOnline does not serve as a sales platform yet. At the moment, it provides full transparency for conventionally placed orders. Customers can also use SteelOnline to view their finished materials, and to decide which of these materials should be delivered at which time. We are considering the possibility of expanding the portal so that customers can also place orders through it.

Delivery can be tricky when it comes to personal online shopping.

That is true. In those cases, you often have to hope that your package is delivered on time and that you are at home when the delivery arrives. We offer a Shipping Allocation application that lets our customers specify delivery times themselves. This allows customers to speed up scheduling.

Who are SteelOnline's target users?

Basically, all of our customers, insofar as they do not already exchange business and process data with us via Electronic Data Interchange (EDI).

How does EDI work?

EDI involves two computers exchanging electronic data with one another. The parties involved define data formats together in advance and send data back and forth between one another.

What resources do you need for EDI?

Not as many as you might think: a computer, an Internet connection, software, and someone who knows what they are doing.

Who benefits from this method of electronic data transfer?

Customers who are already working

“We want to digitize business processes with all of our customers to the greatest possible extent.”

Ansgar Heitkamp, Head of E-Business & EDI

with SAP or another standard software. They do not have to have the same system as us, but they need to be able to import and export data. We then specify the interface and technology together so that our computers can ‘talk’ to one another.

That sounds easy!

It is. We have been working with EDI for about 20 years now, so we have a lot of experience. We use various types of messages and formats to help the two IT systems with interchanging the information. It is our job to define these messages and formats together with customers.

So your department creates these kinds of e-business solutions together with customers?

Correct. Generally speaking, customers turn to these kinds of solutions when they want to stop working with paper and only communicate with us digitally. We check what this conversion would require and decide whether we can use EDI with the customer in question, or if they should use SteelOnline instead.

What is the difference between EDI and SteelOnline?

When customers work with EDI, they work in their own system environment. EDI also supports nearly all business processes: ordering, providing ready messages, specifying shipping details, invoicing, and the like. Everything can

be automated. The EDI connection, especially the order EDI, lends itself well to items that are repetitive. Electronic data exchange is a process of give and take, so it enables customers to send large volumes of data. SteelOnline, on the other hand, is an online platform. As such, it is an additional service that we offer for customers without EDI capability.

How has the customer response been so far?

Very positive. For example, around 60 percent of orders for thyssenkrupp's Steel division are placed via EDI. We want to increase both EDI and SteelOnline usage – and our customers want that as well.

How difficult is it to establish an EDI connection between thyssenkrupp Steel Europe and a customer?

That varies strongly. It depends on the customer's IT environment and the information that needs to be exchanged. We have to start by precisely defining this information together with the customer. We can often work with standard formats, but sometimes everything needs to be customized.

What additional options does electronic data exchange via EDI offer?

EDI also enables the exchange of CAD data – with large automotive customers, for example. In those cases, as with all other transactions, we set up a proprietary and secure data space between ourselves and the customer, since new and further developments naturally concern highly sensitive information.

What is E-Business' long-term goal?

We aspire to digitize as many business processes as possible, together with our customers. That way, we can work with one another without using paper.

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A new repository for old media

A sign of transience: In the Swiss municipality of Büron a **library building** has been covered with weatherproof PATINAX® structural steel.

Text: Reiner Schweinfurth

The Gutenberg era is far from over. In the Swiss municipality of Büron near Lucerne, the finishing touches are being put on a book storage facility that will soon serve as a new home for 14 million written documents, making it one of Switzerland's largest repositories for printed materials.

The designers have built an architecturally challenging building covered with PATINAX® from thyssenkrupp's Heavy Plate business unit. "Weatherproof construction steels have been around since the 1930s," says Nina Kolbe, a member of the Technical Customer Support team of thyssenkrupp's Heavy Plate unit. "They have been produced in Germany since the late 1950s for use as facade construction steel, among other things." The product has been part of thyssenkrupp's portfolio since the 1970s, when it went by the name of COR-TEN®. Since then, steel composition and manufacturing processes have continually been adapted to modern requirements. "Our customers can still rely on the good physical properties and excellent quality of our weatherproof steels." Thanks

to natural corrosion, the material is able to achieve an aesthetic effect that architects, too, find impressive. "The new building is located in a rural area," says Pius Glanzmann, an architect at gzp architekten in Lucerne. "It stands in relation to nature and the scattering of agricultural buildings in the area. This caused us to look for a material whose surface exhibits a subtle, heterogeneous look, like the wood used in barns." And they found what they were looking for. Eleconstruct & Partner, a planning and design office in Emmen, proposed PATINAX® in cooperation with thyssenkrupp's Heavy Plate unit and its Swiss representatives.

The material features a steel alloy that has been optimized as compared

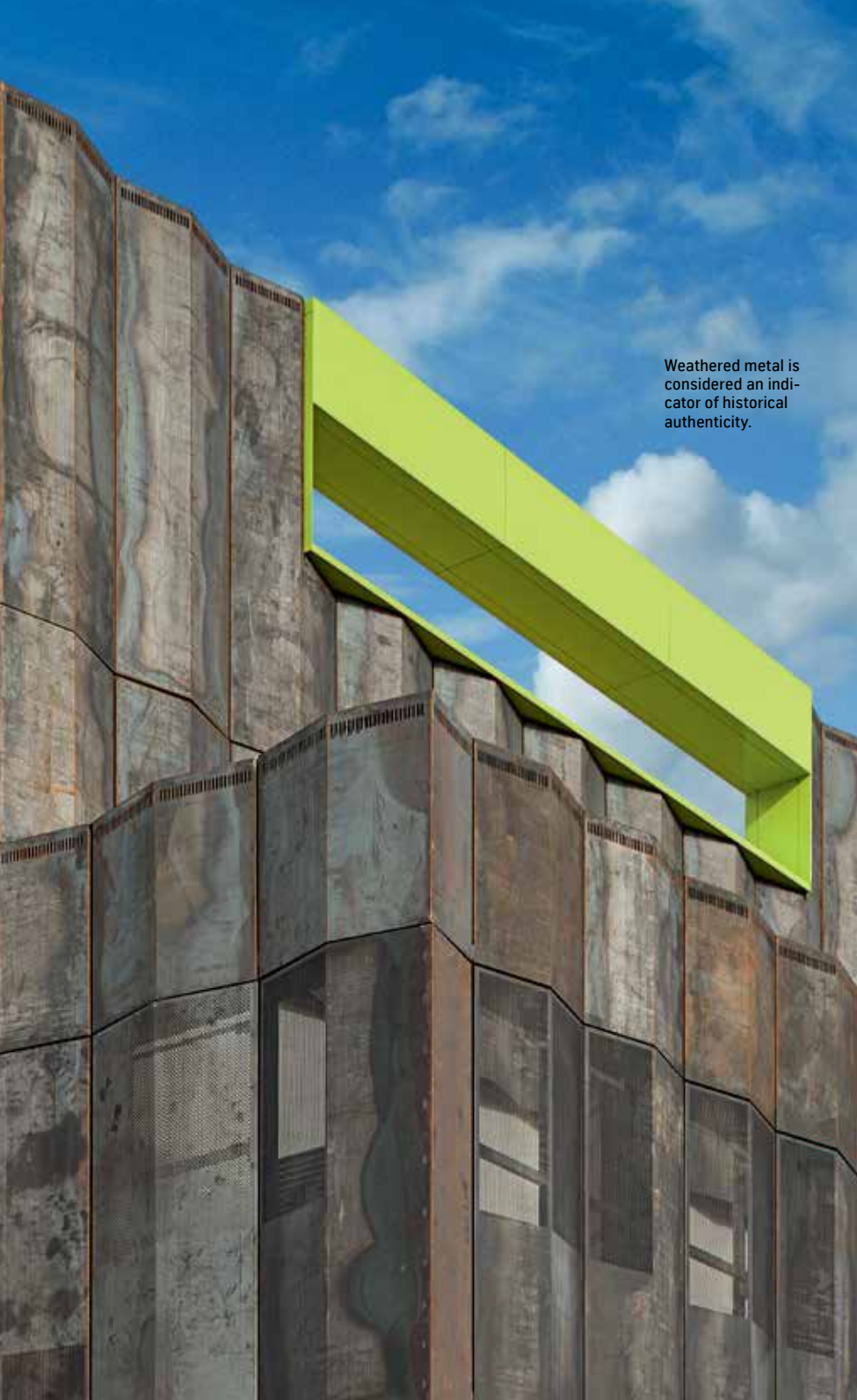
"Customers appreciate its self-sufficient look."

Nina Kolbe, Technical Customer Support, Heavy Plate



Universal knowledge: Millions of books are stored at the archival library in Büron.





Weathered metal is considered an indicator of historical authenticity.

to standard structural steel and contains copper, chrome, and nickel. These important additives allow the material to form a so-called 'patina,' a layer of rust that looks natural, protects the material, and clings to it firmly. It makes the steel exceptionally resistant to atmospheric corrosion. "When specific structural measures are applied, the steel rusts much more slowly, and the patina is able to form and regenerate itself undisturbed. There is no need for special maintenance," explains Thorsten Krenke of Research and Development in thyssenkrupp's Heavy Plate unit. The imposing building will provide a new home for collections from a total of five libraries: the Universities of Basel and Zurich, the Central Libraries of Zurich and Solothurn, and the Lucerne Central and University Library.

Solar power and energy piles will be used as energy sources. The piles draw on geothermal heat and are buried in the ground at depths of up to 28 meters. The entire fully automated system costs approximately 30 million Swiss Francs (or roughly 27 million euros). PATINAX® will lend the building a distinctive look, with a facade that changes over time and varies with the weather. "The archive contains both new and old books. Subjects such as time and transience play an important role. And rusting steel is the best way to express this," says Glanzmann.

The material allows for a broad range of applications. In addition to facades, it has also proven its value in bridges, fireplaces, railway carriages, and artistic steelwork. Interest in PATINAX®-brand weatherproof construction steels is increasing. "Customers appreciate its natural and self-sufficient look," says Kolbe. "As a result, we have received a lot of queries from Germany and abroad, especially southern Germany, Austria, and Switzerland."



New ways of looking at rusted surfaces

Rust used to be considered an indicator of decrepitude and poor quality. But in the mid-20th century it began to appear in galleries and museums in connection with object art. In the 1970s, artists began installing rusted works of art outdoors, and the reaction was not always positive. Not until around the turn of the millennium did rust awaken the aesthetic interest of Western industrialized nations and become a part of everyday culture. Rust is now considered an indicator of historical authenticity and nostalgia. Its positive connotations are further emphasized by the term 'patina.'

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Thorsten Krenke, Research and Development, Heavy Plate business area, +49 203 527 5376, krenke@thyssenkrupp.com



An enameled pot from Riess: It looks just as good as what you can cook in it.

Nostalgic kitchen aid

In Mostviertel, the southwestern quarter of Lower Austria, **Riess** is producing its ninth generation of enameled pots for cooking and baking.

Text: Melanie Wagenhofer

The sight of beautifully curved pans, measuring cups, and ladles made of enamel brings joy to the hearts of more than just hobby chefs and retro lovers. Even star chefs like Alfons Schuhbeck and Sarah Wiener succumb to the charms of the material, whose advantages are not merely aesthetic. It saves energy, because you cook with the entire pot, not just the base. And low temperatures (500 watts is enough) further ensure energy-efficient cooking.

Consumer goods made of steel enamel are resistant to cuts and scratches, as well as being temperature resistant, induction compatible, and one hundred percent recyclable. “We started producing induction pots back in 1922, even though induction stoves would not be invented for another 80 years,” jokes Friedrich Riess. Together with his cousins Susanne and Julian he leads the Riess family business, the only cookware manufacturer in Austria and one of the last producers of enamel cookware in Europe. The source material comes partly from the Steel division of thyssenkrupp. And delivery is fast and flexible. “Each week I tell them how much I need at the moment,” says Riess. The steel company prepares broad sheets of cold-rolled steel suitable for enameling and sends them to Mauthausen, where the Steel Service Center cuts them into smaller coils and ships them to Riess in Ybbsitz.

The first step in Ybbsitz is to shape the steel at a pressing plant. From there it is sent for processing at the enameling plant. The enameling process creates a glassy coating on the metal that not only looks good, but also protects the object from corrosion. Enamel is primarily smelted from a mixture of quartz, feldspar, borax, soda, potash, and metal oxides, known as ‘frit,’ which is milled and mixed with additional additives. The resulting pasty substance is referred to as enamel slurry. Experienced employees apply it by hand to the steel blanks either by submerging the steel in it or spraying it on.

Continuity and sustainability

Mixing bowls, pots, and forms for soufflés and Bundt cakes hang swinging from conveyor belts on their way to the drying line, before going on to be fired. The furnaces generate temperatures of 850 degrees Celsius, and the waste heat is used to dry the products and heat the hall. This saves energy. Visitors encounter sustainability and durability all over the company’s premises, from traditional, pastel-colored pots reminiscent of Granny’s kitchen utensils to machines that date as far back as 1926 and are better at the job and more energy efficient than many new devices. Friedrich Riess is especially proud of the awards the company has received for environmentally friendly production. Thanks to a hydroelectric power station

built by his grandfather just for the company, manufacturing at the plant has been energy self-sufficient since the 1920s.

The company’s flexibility helps it maintain its position as Austria’s only cookware manufacturer and deliver to 38 countries worldwide. Items that have vanished from the market are reissued as needed, sometimes in small quantities. Products that have yet to appear are developed from scratch. This goes for tools and enamel signs as well as design objects and special products of all kinds. thyssenkrupp Steel is the right partner for these jobs, too. Carsten Jansen has been a member of thyssenkrupp’s Technical Customer Support team for eight years, during which time he has relied on an entire team of metallurgists, welding experts, and enameling specialists. Together they tackle problems and new design possibilities, for example, by coming up with ways to improve the formability of the source material, steel.

The family business is currently in its ninth generation, but its future is secure. “Knowledge is our capital,” says Riess. And so the company is sure to remain an heirloom for generations. Just like its products.

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A conversation with thyssenkrupp colleagues: Stefan Eiden (left) and Lutz Kessler discuss the development of a new dash panel cross member.

“We think outside the box.”

Service is a top priority in thyssenkrupp's Steel division. **Stefan Eiden** from Customer Service and **Lutz Kessler** from Application Technology present the new service portfolio.

Interview: Judy Born

What do you offer your customers?

Eiden: We have defined seven service packages that we offer on a modular basis. The products range from seminars, workshops, and analyses of materials and processes to substantial support for optimizing costs and weight.

Kessler: The content depends on the customer, however. A workshop for purchasers focuses on economic efficiency, logistics, and an understanding of the steel production process. By contrast, everyone from the pressing plant wants concrete information about processing characteristics or new production processes. And a developer is interested in the choice of materials or the properties of new coatings.

So your job is essentially to consult on steel-related issues?

Eiden: You could say that, because our products present a lot of possibilities. Our job is to identify the right material for a component and to integrate it into the customer's vehicle architecture and production philosophy. We seek to advise customers that they will achieve better results with our innovative products as well as our conventional ones, whether it's a question of weight, cost, or safety.

Early exchange of information is therefore a decisive factor?

Eiden: Absolutely. The earlier we get involved in the customer's development process, the greater the potential to implement our ideas. For example, if a new product is about to be put on the market, we make sure it is introduced early enough to allow our purchasers adequate time to sample and deploy it.

Kessler: For this purpose, we also make individual data such as material models available to customers for use in the virtual world, and we explain the properties of products and the results of our tests. The latter is extremely important, because not all customers have the same software standards.

Do you explain how to read the data?

Kessler: I would put it differently: We carry out our analyses, explain the results, and work together to arrive at conclusions. We do not do this in every case, but there are customers who lack the technical capabilities or do not have employees with the requisite skills.

Eiden: Customers only decide in favor of something new or different if they see added value in it. Our job is to make this added value visible.

Who do the offers go through?

Eiden: They usually go through Sales. We contribute our understanding of the customer's needs, after which our coworkers in Application Technology contribute their technical expertise. This ensures that our advice is professional and right on the money.

Kessler: There is no point in our suggesting a material that the customer does not want, even if it would be a better solution from our technical point of view. Such an approach would be counterproductive. So in cases like this, we rely on the expertise of the Sales department.

Eiden: The key account manager is usually the customer's first point of contact. In some cases, the customer consultant or the engineer responsible for the project may also be an important contact, for example, when the customer is seeking to improve processing methods. It isn't always the material itself that is put to the test.

Your service portfolio includes both materials and production processes?

Kessler: That's right. And it also indirectly includes plant design, for example for hot forming. If a customer wants to get on board in this area, we offer them everything the Group has to offer, from consultation to preparation of prototypes and resources.

► **Eiden:** Our holistic approach, which combines developmental expertise with specialized knowledge of the product and its processing, sets us far apart from the competition. That's because we work with our customers to develop intelligent solutions involving steel.

Is the service portfolio strictly limited to the automotive industry?

Kessler: No, it is also open to other industries, for example, industrial and heavy plate customers. The focus, however, is on the automotive industry, because it comprises a large percentage of our customer base and often drives innovation.

Eiden: Car manufacturers challenge us the most, because they have to be innovative to remain competitive. Nor should we forget that they are major customers, meaning that profitability is another given.

What are the challenges?

Eiden: CO₂ limits have to be observed, which requires lighter construction methods. Crash requirements are also getting stricter, and the structure of the vehicle has to take them into account. The pressure to cut costs is immense. The complexity of vehicle development has increased enormously, not least because of our large portfolio of materials. The sooner a customer gets us involved, the greater the chances for optimization.

What does a customer have to bring with them to benefit from the service portfolio?

Eiden: Openness and trust. In the beginning they will often have to provide us with data so that we have something to base our work



Our job is to make the added value visible.

Stefan Eiden

People

Stefan Eiden

Left AUDI AG for thyssenkrupp Steel Europe in 2000, but maintained his ties to the automotive industry as a key account manager for Daimler Chrysler and Toyota/Honda, among others. Became head of the Duisburg steel group's Customer Service area for all automotive customers a year ago.

Lutz Kessler

Completed his undergraduate and graduate studies at the University of Dortmund in the field of production technology. Began working at thyssenkrupp Steel Europe in 1996 as manager of the central Quality and Testing department. As of last year, responsible for coordinating all teams in Application Technology.

on. And they have to be ready to implement innovative solutions. That may require additional effort in the early stages, but it will pay off during production in the form of reduced weight or costs.

Kessler: Trust is the most important aspect of our customer relationships, some of which have lasted for decades. Our outside perspective helps us think outside the box. Our job is to show the customer where we see potential for another processing method or a different material. We are steel consultants, so to speak.

You already have experience, especially in the automotive industry...

Eiden: Absolutely. In the past we have developed many different car concepts. InCar®plus is a recent example. We have an extraordinary amount of in-house expertise with regard to resources, materials, and points of contact.

Kessler: And of course we benefit from working with partners within the Group. Take, for example, our cooperation with employees from Components Technology and Industrial Solutions. The expertise that we are capable of bringing together is part of what makes thyssenkrupp so unique.

Does this level of engagement pay off in the end?

Kessler: When we help a customer manufacture a component and the result is that rejects are no longer produced or the process is accelerated with no reduction in quality, this positive experience will hopefully persuade them to stay with us.

Eiden: We obviously have to take the bottom line into account. That is why we are targeting specific customers with this service portfolio. Both sides have to benefit, so that a win-win situation results.



We are steel consultants for our customers, so to speak.

Lutz Keßler

2016

April

TUBE 2016, Düsseldorf

4–8 April 2016,
Hall 3, Booth C 28



International experts meet at the tube and pipe industry's international trade fair to keep abreast of the latest developments in the field. Forward-looking trends involving machines and facilities for manufacturing and processing pipes and pipe accessories are presented annually in Düsseldorf. At a booth shared with other subsidiaries, the Steel division of thyssenkrupp will present innovative products for the manufacture of steel pipes.

BAUMA 2016, Munich

11–17 April 2016,
Hall A 6, Booth 550

The 31st international BAUMA trade fair is the world's largest exhibition of this kind for the construction machinery sector. It is seen as a driving force for global innovation and success, as well as a marketplace for the industry, where an exceptional number of innovations are presented.



The Steel division of thyssenkrupp will be represented by the Heavy Plate unit, which will present XAR®, a special structural steel, and two types of heat-treated steel: N-A-XTRA® and XABO®. The company will also host its traditional customer event on 14 April 2016.

May

CWIEME 2016, Berlin

10–12 May 2016,
Hall 4.2, Booth E20

CWIEME is considered the leading international trade fair for coil winding, isolation, and electrical manufacturing. The trade fair also features an accompanying conference program. thyssenkrupp Steel Europe and thyssenkrupp Electrical Steel will once again jointly present grain-oriented and non oriented product solutions for the electrical industry. Our subsidiary thyssenkrupp Magnettechnik will also participate in the presentation.



June

Eurosatory 2016, Paris

13–17 June 2016,
Booth H692

Industry visitors can find answers to all types of questions about security and defense at Eurosatory. thyssenkrupp's Heavy Plate business unit will present its highly specialized Secure® steels as product solutions for security-related applications.



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For this issue's Agenda conversation, the editorial staff traveled to the Westfalenhütte, an industrial site in northeast Dortmund. The photo shoot took place in the hot forming area, where tests are usually run for customers. To accommodate the shoot, the area was temporarily converted into a photo set, lit with lamps and dressed with model components as props. Employees served as extras.



What is this garden tool called?

It is also known as a soil loosening pick and owes its name to the tapering shape of the steel. If you know the name of this tool for tilling the ground, enter the competition!

One winner of an iPad mini 3 will be chosen at random from all the correct entries.