

Bringing color into play

Coil-coated flat steel from
the PLADUR® brand meets the
highest standards of quality and style

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INTERVIEW

Matthias Kleiner and
Hans Jürgen Kerkhoff
talk about the
systemic importance
of the steel industry

INNOCITY

City traffic moves into
the third dimension

NEW DEVELOPMENT

New varieties of
electrical steel have got
all the right moves

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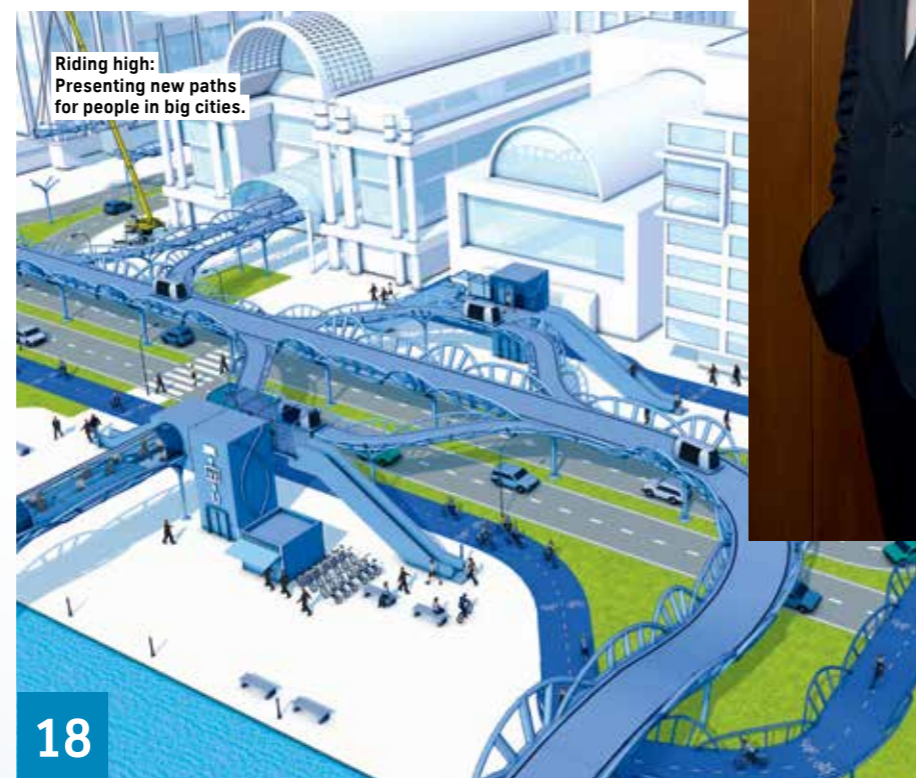
In agreement: Matthias Kleiner and Hans Jürgen Kerkhoff know that science and economics go hand in hand.



08

A splash of color!

Example: Flat steel coating using the coil coating process developed by ThyssenKrupp Steel Europe produces a variety of products while reducing costs.



Riding high: Presenting new paths for people in big cities.

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Welcome to Berlin: We met Matthias Kleiner (left) and Hans Jürgen Kerkhoff.

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Photos: Title: Gettyimages, Shutterstock pages 2-3: ThyssenKrupp Steel Europe Photography (2), Cem Guenes Illustrations: KicherBunkardt, Infografik



Dear readers,

Can you imagine living life in black and white? I was five years old when color television came to Germany in 1967, bringing a colorful world into living rooms everywhere. Colors awaken memories and trigger certain emotions based on a person's experiences or cultural background.

For us, blue represents freedom and harmony while red is the color of vibrancy – and danger. The same applies to patterns. Stripes seem tidy, polka dots appear playful, and checkerboards suggest rationality.

Colors are what makes life beautiful, and patterns keep things exciting. That's how we see it anyway, and our Color division has been at work for decades bringing a variety of decorative accents to our business, as well as to public spaces. For more information on this topic, see the title story.

Our new InnoCity project is an attractive, space-saving solution. This fine infrastructure concept lifts city traffic onto a second level, and offers practical and affordable solutions for the urban mobility of the future. We live in a dynamic environment that needs to keep changing with the times, and Germany, as one of the world's most innovative countries, plays an important role in these developments. Will Germany continue to be a leader in the future? Matthias Kleiner, President of the Leibniz Association, and Hans Jürgen Kerkhoff, President of the German Steel Federation (WV Stahl), will be discussing this question.

And as a side note: You no longer have to read about these exciting topics in black ink on white paper – you can also access this issue at: thyssenkrupp-steel-europe.com/compact. I wish you an enjoyable and colorful read.

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

We are online!



Following the relaunch of ThyssenKrupp Steel Europe's website, compact^{steel} is now available online:

www.thyssenkrupp-steel-europe.com/compact

View



New cutting patterns

The technology for producing Damascus steel has been around for 2,500 years. In ancient times, it was used to forge blades of extraordinary strength and sharpness. Damascus steel consists of multiple superimposed layers of hard, tough steel. This steel composite is not only hard, but also elastic, and it is particularly suitable for the production of high-quality knives. Hoesch Hohenlimburg is working on the newest generation of materials for such cutting tools. The Multibond composite material can be used to re-engineer the attributes of the characteristically grained Damascus steel blades. The high-quality knives guarantee longer blade life, offer extreme fracture toughness, and are highly decorative.

Back from vacation

After three months of renovation, Blast Furnace 2 in Duisburg-Schwegern has been fired up again.

For about 21 years, 'Schwegern 2' had remained in service and produced about 78 million metric tons of pig iron. After all those years, it was high time for a phase of extensive renovation and modernization. The two-meter-thick, fireproof lining was renewed, the furnace's cooling system modernized, the cast house renovated, and the hot blast stove, the gas cleaning system, the slag granulator, and the expansion turbine were repaired.

For all this modernization, ThyssenKrupp Steel Europe invested more than 200 million euros. At the same time, Continuous Casting Line 1 in Beeckerwerth was also upgraded. Among other things, the entire casting line was replaced, and a new slab cooling system was installed. All these measures were essential for site consolidation, and they also went a long way towards strengthening the company's competitiveness and sustainability. "We achieved substantial improvements in efficiency and quality of our product portfolio with these measures," says Dr. Herbert Eichelkraut, Member of ThyssenKrupp Steel Europe's Executive Board.

In its second 'furnace campaign,' i.e., the production period between two phases of modernization, Blast Furnace 2 is now smelting about 12,000 tons of pig iron every day at temperatures of up to 2,000 degrees Celsius. It will be a long journey: The next renovation is not expected for another 20 years.

ThyssenKrupp Steel Europe's modernization measures encompass a number of large projects: the renovation of Hot Strip Mills 1 and 2 in Beeckerwerth, the upgrading of Converters 1 and 2 in Bruckhausen, and the relining of Blast Furnace 9.

A rare view: Temperatures in this part of the furnace normally exceed 2,000 degrees.

Hiesinger will remain head of ThyssenKrupp for five more years

Heinrich Hiesinger's contract as CEO of ThyssenKrupp AG has been extended to 2020. This was officially confirmed by the Supervisory Board in its meeting at the end of November. The second period of office gives Hiesinger the opportunity to press ahead with his long-term plans for the industrial and technology group. The 54-year-old has received confirmation that the Group is moving in the right direction from many sides. "The Supervisory Board values the consistency, sense of moderation, and also the steady hand with which Heinrich Hiesinger and his Executive Board team have implemented the extensive changes. The company is on the right track," says Supervisory Board Chairman Ulrich Lehner.



Current climate policy threatens local industry

The tightening of emissions allowance trading is viewed by the steel industry with apprehension. The European Council's decision on energy and climate policy involves a 43% reduction of emission allowances. That would cost the industry an unacceptable additional 1.4 billion euros according to Hans Jürgen Kerkhoff, President of the German Steel Federation (VW Stahl). For basic materials industries that, like the steel industry, face international competition, it is imperative that the regulations for the period following 2020 be renegotiated. On the other hand, Kerkhoff welcomes the decision that the most CO₂-efficient companies are not to bear disproportionate costs.

Photos: ThyssenKrupp Steel Europe Photography (6), PR



Dr. Veit Echterhoff (center) of the ThyssenKrupp Steel Europe HR Center, with Josh Collett (left) and Eric Schneidewind of the AARP.

Excellent employer

The personnel policies of ThyssenKrupp Steel Europe have been recognized internationally. They encompass areas such as life-long learning, knowledge exchange between young and experienced employees, and continuing education opportunities for all employees. Concepts such as individually tailored working time models and a company child day care center strengthen the compatibility of family and work. This earned the company the Best Employer prize from the AARP (American Association of Retired Persons), an American non-profit organization. ThyssenKrupp Steel Europe won the prize for the first time.

Network connection: compact^{steel} is online.

Effective immediately, compact^{steel} can also be found on the Internet. In the context of a relaunch of the ThyssenKrupp Steel Europe company website, the customer magazine will now have its own page. At thyssenkrupp-steel-europe.com/compact, we are presenting a selection of topics from previous issues along with the most important sections from the current one. Videos, animations, and picture galleries bring additional information and entertainment to the website's offering.



WHERE STEEL IS AT HOME

Duisburg is the biggest steel city in Europe, which is confirmed by the autobahn signs in the Ruhr region. In addition to ThyssenKrupp Steel Europe, ArcelorMittal and HKM help to secure this status. More than 15 million metric tons of pig iron are produced here each year.

+2.6

PERCENT IN 2015:

The demand for European steel will grow by this figure according to the European steel association Eurofer. Despite this rise, European companies are still working under difficult market conditions.



In great demand: Customers especially value the quality and know-how of ThyssenKrupp Steel Europe.

That's great, but there is still room for improvement

Every two years, ThyssenKrupp Steel Europe asks its customers for feedback. Some areas still need improvement.

At the beginning of the year, we again asked the question: "How satisfied are you with ThyssenKrupp Steel Europe?" For the second time since 2012, we called on our customers to share their opinions with us in an online survey. The results are representative and gratifying: Satisfaction with our company has risen slightly.

The customers were won over by the quality of our products, our expertise, and the technical consultation offered by ThyssenKrupp Steel Europe.

Respondents thought it important, however, that deadline observation and response times be improved. We are already at work on these areas. Our individual sales teams will also implement further optimization measures in cooperation with our customers.

In all, 776 international customer companies from the automotive, industrial, and heavy plate sectors were contacted – with a high response rate. The next customer survey is scheduled for 2016.

The entire online service of the business area has recently been optimized. It features a modern design with new features and contact options at www.thyssenkrupp-steel-europe.com.

Story

Just a facade:
High-quality painted steel
gives buildings the
appearance of natural wood.

The color sets the tone

PLADUR® brings
color to humdrum facades
and turns monochromatic surfaces
into exciting designs.
And that's not all...

Text: Christiane Hoch-Baumann

Since 2010, office life at the new ThyssenKrupp headquarters in Essen has been taking place behind an attractive steel facade. 'Ordinary visitors', mainly notice the headquarters' stylish, imposing, and exclusive exterior, while specialists would take a closer look at the champagne-colored facade and discover steel panel rainscreen cladding. "We could also choose a colorful facade or one that looks like natural wood," says Sales Manager Axel Pohl from ThyssenKrupp Steel Europe in Kreuztal near Siegen. The steel company has color experts working at a total of three coil coating systems located in Duisburg as well as in the Siegerland region.



Elegant headquarters: the ThyssenKrupp head office in Essen.

"To meet the individual needs and expectations of our customers, we have tailored our sales to accommodate the various relevant industries," says Pohl, who, among other things, is also responsible for all of the company's organic coil-coated PLADUR® products. "Our core market consists of the construction and garage door industries as well as the commercial vehicle and household appliance industries."

Civil engineer and multi-story building expert Klaus Kottkamp played a major role in the construction of the ThyssenKrupp headquarters. Together with his team at the company headquarters in Duisburg, he consults with architects, planners, and processors in the areas of structural engineering and design. "With our high-quality color creations and specially-selected surfaces, we give the metal facades of the buildings a unique architectural touch – both on the inside and outside of the facade." This is just business as usual for Benjamin Fitze, the man in charge of industrial engineering and service center customers. "You only get one chance to make a first impression, and it had better be a good one – even when it comes to industrial architecture," says Fitze. PLADUR® makes it possible. The product also offers excellent value compared with conventional materials.

PLADUR® offers freedom for design inspiration

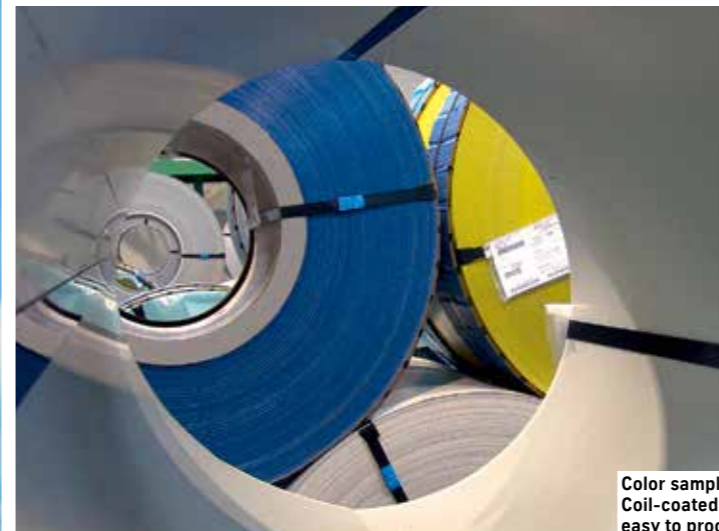
How does it work? "Our product successfully combines high-quality flat steel with an organic coating," says Fitze. "This inspired aesthetic gives the buildings a unique, attractive appearance while effectively protecting them from corrosion and UV radiation." PLADUR® facades are weather-resistant

PLADUR® is weatherproof and stands the test of time.

and stand the test of time so that buildings retain their value. Customers can choose between paint, foil, or a combination of both coatings – anything is possible. Customers can also choose colors from nearly the entire RAL and NCS color ranges in addition to metallic tones, and select from a wide range of finishes – from matte to glitter and from sparkle to high-gloss. According to Kottkamp, "we also produce precision textured surfaces such as stone, terracotta, and wood. We offer a nearly endless array of different design options."

As part of his work in multi-story building and industrial engineering, Benjamin Fitze is also responsible for ensuring that the facades are functional. "Our materials can take on a number of properties depending on the application in question. For example, we have coatings that are particularly easy to clean – even when it comes to removing graffiti –

Going green: With over 100 different colors to choose from, the ReflectionsOne® series is a perfect fit for any environment.



Color sample: Coil-coated coils are easy to process (above) and offer a variety of properties for facades (below).



and coatings that absorb moisture," he says. So is PLADUR® the chameleon of steel sheet surface coating systems? "I wouldn't go that far," says Kottkamp. "But we have such a large selection that planners, architects, engineering firms, and building owners can easily use our products to achieve any effect they want, transforming their building into a calling card for their company."

The general ease of processing of the material further facilitates creating a unique building concept. Special custom-built elements are just as easy to manufacture as standard components. In short, the organic coated steel sheet can be curved, stretched, or bent to fit the individual application. It can be shaped, cut, joined, or bonded to other elements as needed – all without cracking the material or compromising the stability of the facade.

Rust doesn't stand a chance

Dr. Torsten Klein is also committed to providing a wide range of different colors and surface finishes while constantly working to incorporate new

Steel takes it easy on the environment

Energy-saving

The steel production process itself saves energy right out of the gate, using only two thirds of the power required to manufacture aluminum. On top of that, thanks to integrated systems for wastewater processing and exhaust gas treatment, the coil coating systems used by ThyssenKrupp Steel Europe exceed all legal standards for emission protection.

Environmentally friendly

The pre-treatment for these materials is chromate free, and the steel manufacturer avoids using any pigments containing heavy metals, hazardous materials, or materials that are harmful to the environment in any of the production processes. These substances are all replaced by alternative materials that comply with EU chemical regulations (REACH) and do not negatively affect the quality of the product.

Colorful, durable, and brilliant

Coil-coated flat steel brings variety to building facades, onto the streets, and into private homes. **Axel Pohl**, Sales Manager of the Color product area, tells us which industries show the most demand for PLADUR® products and talks about the most popular colors and patterns.

Interviewed by: Judy Born

Which industries purchase your products?

Axel Pohl: Our PLADUR® product is mainly used in the construction industry, the garage door industry, and the commercial vehicle and household appliance industries. In addition to offering standard products, we have also developed a number of innovative custom projects for these industries, often in cooperation with our customers.

Which innovations are you referring to in particular?

Well, for the construction industry there is **ReflectionsOne®**, a specially coordinated collection of over 100 colors that help to integrate building facades into the surrounding environment. We also developed and patented the multi-layer product PLADUR® E, which is ideal for external covering on refrigerator trucks.

What are the differences between the PLADUR® products?

The products use different types of steel, alloys, and coatings depending on the industry in question and the requirements of the individual customer. Sometimes functionality is the top priority, and other times aesthetics are more important. Take refrigerator trucks, for example: While it's important for the vehicle to look good, it is more important for it to be resistant to scratches, corrosion, and chipping caused by flying stones. For refrigerators and garage doors on the other hand, end users want attractive products that inspire strong emotions.

And what do the products have in common?

For all these products we deliver the final coating free of charge. Regardless of the industry, customers who order a PLADUR® product save money as they don't need their own finishing shop, so there's a definite advantage in terms of cost.

That doesn't mean that customers have to choose between style and function, does it?

No, naturally all of our coated steel products offer the same high level of quality, and a garage door designed to look like wood can both look good and withstand extreme weather conditions. Our PLADUR® Wrinkle product, for example, is a specially developed coating for

steel roof tiles designed to create a robust, wear-resistant surface with an elegant, matte finish.

How environmentally friendly is the process of manufacturing coil-coated materials?

Generally speaking, our product is highly environmentally friendly because it can be recycled – including the coating, of course! Our pre-treatments are chromate free, we avoid pigments containing heavy metals, and we always use cutting-edge technology. So when it comes to PLADUR®, steel is going green.

What are the most popular looks in the Color area?

As regards facades, natural looks – coatings designed to look like stone or wood as offered by the PLADUR® Relief stone and Relief wood product range – are particularly popular at the moment. Relief wood is popular in brown, but also in gray tones, which give it a unique, abstract appearance. For multi-story buildings, customers gravitate toward a metallic look, for example, **ReflectionsPearl®**, and for household appliances, bright colors are in fashion: white goods are getting more colorful by the minute.

Do you deliver to small- and medium-sized companies as well as OEMs?

We are willing to do anything for our customers across the board, and building and maintaining close customer relationships is key. As a flexible and diverse supplier, we develop customer-specific solutions to complement our wide selection of standard products. ThyssenKrupp Steel Europe is an innovative, strategic business partner.

What buildings would you like to see decorated in your products?

I already know the answer to that question: As a huge Borussia Dortmund fan, I would love to cover the Signal Iduna Park stadium with PLADUR® in black and yellow.

At Sales Industry **Axel Pohl** is responsible for the Color product division and the key account of household appliances.
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Elegant and functional: durable garage doors in anthracite.



Strong and durable: robust semitrailer.

Thanks to coil coating, customers can avoid the expensive process of painting individual elements.



A 'cool cooler' for around the house: refrigerator in stainless steel look.

hot-dip galvanizing process, for example, using our ZM EcoProtect® zinc-magnesium coating." High processability and excellent quality are the most important factors in these industries. "Each product must pass a series of grueling tests before we are willing to market it under the PLADUR® name."

Final coating delivered free of charge

The ThyssenKrupp Steel Europe Color team also delivers starting materials to another important sector, offering ever greater creativity and functionality without compromising on quality.

"White goods were yesterday – today's washing machines, dish washers, refrigerators, etc. are becoming more and more colorful and underscore the creativity of the owner," says Michael Schulte-Zweckel, who supplies coated steel strip to the household appliance industry. "The market for household appliances – a market that we have been supplying with PLADUR® products for over 40 years – has changed in recent years, and we are trying to do our part to contribute to the design."

There are now washing machines with batik-look steel casings and extra-large American-style refrigerators that look as though they are made of stainless steel but are completely fingerprint-resistant. There are also dishwashers that bring the elegance of copper or wood into the kitchen.

"Departure from the norm is currently a trend in this industry, and it is often far more affordable for our customers to have us manufacture the necessary surfaces using the coil coating process and then use the material we deliver to produce the end product. This way, they can avoid the expensive, labor-intensive process of coating the individual pieces later on."

properties. As a member of the Color team in the Siegerland region, he is responsible for the garage door and commercial vehicle markets. The material used in his areas is subject to very special requirements. "Opening and closing, day in and day out, sometimes in the pouring rain and sometimes in scorching heat or freezing cold. The materials used in sectional, up and over, roller, or hangar doors must be absolutely resistant to abrasion, scratching, stains, and wear," says Klein.

The same applies to commercial vehicles, which travel hundreds of kilometers on expressways and rural roads every day: fleets of agricultural vehicles, including semitrailers, trailers, and tractors. "The most important property in these types of applications is corrosion protection, which we can provide using a specialized coating formula along with the

Photos: ThyssenKrupp Steel Europe Photography, Hormann, PR (2)

Download the product brochures at:
<https://www.thyssenkrupp-steel-europe.com/en/products/organic-coated-strip-and-sheet/organic-coated-strip-and-sheet-overview.html>

Hutthurm in Germany's Passau district: The building's facade shimmers in dark brown.

Andreas Schiermeier's business has become a real attraction.

Architect Albert Köberl is impressed that the PLADUR® elements are so easy to handle.



Shining Bavaria

The facade of the new building of a modern kitchen and furniture studio in Germany's Lower Bavaria region is made entirely of sandwich panels from the PLADUR® Relief iceCrystal series.

Text: Dorothea Walchshäusl



When it comes to cladding on commercial and industrial buildings, color and design are key. Colorful surface designs have established themselves as an exciting alternative to conventional gray facades. Coil-coated steel sheets from ThyssenKrupp Steel Europe offer the perfect way to liven up any building. This high-quality galvanized steel painted using the coil coating process not only meets customer needs for a highly practical and affordable solution, it also has a special look that allows customers to be creative and work with a wide array of colors. In addition to color, these products also offer a range of options for gloss finishes and finely textured surfaces which give the colored steel sheets a very special appearance. PLADUR® Relief iceCrystal is a real eye-catcher. This specialized coating achieves a unique effect which truly allows the building facade to shine.

In order to turn the materials delivered by the steel manufacturer into sandwich panels for high-quality facades, some of the color-coated steel coils are sent to Romakowski GmbH in Buttenwiesen near Augsburg. Service partner Walter Patz is also called in to provide additional support. Since 1984, both Romakowski and the steel manufacturer have reaped the benefits of this successful partnership, a business relationship which Axel Pohl, Sales Manager of the Color team at ThyssenKrupp Steel Europe, characterizes as "very close and cooperative." Matthias Lang, Procurement Manager at Romakowski, agrees, adding, "Both companies have developed as a part of this relationship." Sometimes the partners even work together to develop new custom products. Before the steel sheets can become finished facade elements, Romakowski must shape them and then finish them off by adding polyurethane foam insulation. By varying the color, the type of coating used,

and the thickness of the foam core, a variety of sandwich elements is created. Then, depending on the area of application, these elements will be used to insulate refrigerated warehouses, replace stonework, or cover roofs or facades. The result of all this work is a final product that is extremely versatile, straightforward, and highly energy efficient.

This spectacular facade concept can be seen in action, for example, at the 'Schiermeier wohnen und leben' kitchen and furniture studio in the city of Hutthurm in Lower Bavaria, where the company has designed its new headquarters using colorful primary materials from ThyssenKrupp Steel Europe and sandwich elements from Romakowski. The dark, angular building with the company's logo – a glowing green ginkgo leaf – is recognizable from quite a distance. Construction began in October 2013, and the studio was opened for business in May 2014. Visitors are now greeted by a store with a unique presence that features an elegant design and a facade which is completely covered in dark brown elements with a micro-lined iceCrystal surface texture. The most impressive part is that depending on the lighting and the perspective, the building reveals new facets and gives off a warm, matte shimmer. "I chose a design that is attractive but not extremely expensive," says building owner Andreas Schiermeier. He is just as impressed by the PLADUR® iceCrystal coating on the material as his customers are. "The people love it," says Schiermeier, who is constantly receiving compliments

We work together with customers to develop new products.

Axel Pohl, Sales Manager for Color, ThyssenKrupp Steel Europe

on his building from visitors to the area. Aside from admiring the extraordinary appearance, Schiermeier and architect Albert Köberl from koeberl-doeringer architekten are also pleased with the practical advantages the facade has to offer. The sandwich elements need only be attached, and after a quick installation they require no additional maintenance, as Köberl points out. The result is a stylish building at an affordable price. Dull gray was yesterday.

Photos: Maria Ir (3), Bender GmbH, Siegen, foto picture-alliance

News ticker

Measuring milestones in millimeters

The employees at ThyssenKrupp Rasselstein have developed a groundbreaking product: an expanded metal mesh that is only 0.13 millimeters thick. This is truly pioneering work when one considers that up until now, the limit for steel was 0.4 millimeters. This expanded metal mesh made from ultra-thin tinplate is fine, very light, and robust – and it is more stable than aluminum while using even less material. This mesh can be used to manufacture filters and is employed in tiling applications for the building trade. The thin expanded metal mesh can also shield electromagnetic radiation, for example, in the on-board devices in cars. End users can even take advantage of the material for their home barbecues. The thin metal keeps the grating clean without affecting the taste of the food or eliminating the typical grill marks.



80,000 metric tons of steel

are required to build the Kingdom Tower by the Red Sea. Construction on the 160-story tower is scheduled to finish within five years. At over 1,000 meters, the Kingdom Tower will be the tallest building in the world.

Steel to stabilize the motorway junction

In Leverkusen, both the highway A1 Rhine bridge and the highway A3 bridge in the Leverkusen junction had to be reinforced with steel. First, the concrete protective wall of the Rhine bridge was replaced by a steel protective wall. Then steel plates were installed in the cable drums in order to stabilize the support cables. The A3 bridge also had to be reinforced. The bridge was too weak to handle the daily traffic and was strengthened by installing additional steel supports.





This is where metropolitan traffic is to flow in the future: Andreas Cott (left) and Ralf Stegmeyer with their InnoCity model.

Still room at the top

According to U.N. estimates, in 15 years two thirds of the world's population will live in metropolitan regions. City planners face a challenge in creating a corresponding infrastructure – and InnoCity could be the solution.

Text: Christiane Hoch-Baumann

Cities experiencing steady growth, like Shanghai, London, or Munich, face a broad range of challenges. One of the primary concerns is the increase in urban traffic, which requires a sustainable infrastructure. How do we want to live in the future? How will we get from A to B? One way to answer these questions is to utilize elegant and space-saving structures such as InnoCity by ThyssenKrupp Steel Europe and Elevator. “We want to increase the capacity for transportation in heavily populated areas by taking advantage of the third dimension,” says Steel Project Engineer Andreas Cott, who is working on the steel infrastructure concept for urban mobility of the future together with colleagues from Innovation and Application Technology. “Many important questions of our time could be answered by providing cities with attractive, affordable solutions for elevated roads and walk-

ways.” InnoCity offers new approaches for traffic and transportation systems that connect people with one another: “With our solution, we will soon be able to integrate elaborate steel bridges flexibly and in an architecturally interesting way into urban structures,” says Cott. This could also put an end to narrow streets crowded with swarms of pedestrians, cyclists, and cars, while providing an alternative to the costly construction of underground transportation systems. “We draw inspiration from processes and forms used in the automotive industry to create modular manufacturing technologies that allow the technological and economic implementation of the project.” The concepts will be fleshed out in the areas of construction, simulation, forming and joining technologies, as well as application technology. The lightweight construction approach allows for slim foundations and construction in sensitive areas – such as inside of subway tunnels, supply lines, and underground parking facilities. As an additional advantage,

Photos: Novac Images/Alamy, ThyssenKrupp Steel Europe, Photography

Aiming high: With cities growing ever bigger, people need to find new ways of moving around.

Population

The world in figures

A megacity is a city with more than 10 million inhabitants. At the moment, there are 19 of them, but by 2025 this number is expected to rise to 35.

The largest city at present is the Tokyo metropolitan region, which is inhabited by 37.2 million people. New Delhi is next with 22.7 million inhabitants.

Asia is home to 61% of the world's population, Africa to 16%.

once erected, these steel structures are easy to maintain. “Modular construction and the recyclable nature of steel make the InnoCity concept extremely flexible and sustainable throughout its entire life cycle,” says designer Ralf Stegmeyer. ThyssenKrupp’s engineers are planning for many generations to come, with the help of colleges and universities. The initial goal for the implementation of InnoCity is the construction of pedestrian and bicycle bridges. Later, the infrastructure concept will be applied to greater weights, such as moving walkways or autonomous vehicles.

The technology is already being used elsewhere: Copenhagen recently opened an elevated bike path. The 220-meter ‘Cykelslangen’ is connected to a 300-kilometer network of bicycle highways extending from the city center out into the Copenhagen metropolitan area. As part of a similar project, architect Sir Norman Foster is planning a network of separate bicycle highways for the greater London area. The German state of North Rhine-Westphalia also intends to extend its bicycle highway network. “These types of projects show the increased demand for futuristic infrastructure concepts such as InnoCity,” says Cott. ThyssenKrupp Elevator holds the key to bridging the gap between ground-level streets and elevated roadways or for delivering alternative transport systems based on their range of solutions: elevators, escalators, moving walkways, and the new ACCEL system, a high-speed pallet band walkway that can carry up to 7,300 passengers per hour. “We are also looking for additional project partners who will help us turn ideas into affordable, functional products,” adds Cott. The most important arguments for InnoCity are that it is a system that can be implemented in the short term and offers stylish and affordable alternatives to existing transportation concepts.

We keep the city of tomorrow in motion

Expanding metropolitan regions and overtaxed transportation routes call for alternative transportation systems. Modular weight-bearing structures of lightweight design allow engineers to apply automobile manufacturing technology to the production of steel structures – and plot out the future of urban mobility.

CONSTRUCTION

Individual modules are prefabricated at the factory and assembled at the construction site. Because they require little space, the segments can be integrated into any existing urban development scenario.



GREATER SUSTAINABILITY

The use of steel, which can be recycled, saves resources and ensures sustainable construction. Modular weight-bearing structures can be swiftly assembled or dismantled.



CREATING CONNECTIONS

To increase capacity, traffic is raised to the third dimension. In addition to underground and ground-level transportation options, elevated roadways connect city districts and link the various transportation systems.



FLEXIBLE SOLUTION

Their modular design allows the weight-bearing structures to be adapted to the traffic requirements of a given area. As straight routes or roundabouts, pedestrian and bicycle paths relieve pressure on busy intersections.



IMPROVED QUALITY OF LIFE

Demographic change, too, drives the demand for alternative transportation routes: Elevated routes linked by elevators, escalators, or moving walkways will improve quality of life and allow mobility for people of all ages.



DRIVERLESS CABIN TAXIS

The elegant weight-bearing structures are also suitable for automated vehicles spacious enough to accommodate up to twelve people. Such vehicles are to be primarily used for short distances where traffic is particularly intense.



LIGHTNING-FAST CONVEYANCE

ACCEL, an innovative transport system from ThyssenKrupp Elevator, allows passengers to quickly cover distances of up to 1.5 kilometers. Airport operators, for instance, can use ACCEL to carry up to 7,300 passengers per hour to distant gates or parking lots at high speed.

Big business for tanks

Liquid gas transportation is booming – and with it the demand for modern tankers. TGE Marine Gas Engineering is one of the world's market leaders in this sector of the shipbuilding industry.

Text: Judy Born

There is a lot going on in our oceans. Alongside the container vessels, cruise liners, ferries, and private yachts, more and more gas transport ships are crossing the seven seas. Around 1,600 freighters for liquid gas are currently in operation. There are two types of freighters: LPG/LEG tankers that transport liquid gases such as butane, propane, or petrochemical gases such as ethylene and propylene, and LNG tanks that transport liquefied natural gas.

Overseas shipping is a viable alternative to gas delivery via pipelines. World political tensions, for example in Eastern Europe, and developing shale gas markets, such as those in the United States, are currently contributing to a boom in the market for specialized freighters. "The LNG business for smaller-scale ships – the market in which we are currently active – is just getting off the ground," says Dr. Manfred Küver, Managing Director of TGE Marine Gas Engineering with registered office in Bonn, Germany. His company is specialized in the sea transport of LPG, LNG, and ethylene. In addition, TGE Marine develops bunker vessels and fuel gas systems for LNG as a fuel.

When Küver speaks of 'smaller-scale' ships, he is referring to ships of around 35,000 cubic meters in volume. His company is currently building four such vessels in Shanghai. When these vessels begin operation, they will be among the largest ethylene/ethane gas tankers in the world. Five additional ethylene/ethane tankers of 21,000 cubic meters are being constructed for the Jiangnan shipyard. TGE Marine delivers these freighters as ready-to-use solutions. "That's our



Massive shipment: A bilobe tank is installed in the rear of a gas tanker.



Ship of the year in 2008: Gas tankers like these secured TGE Marine's position as world market leader.

Ship type

LNG tanker

Liquefied Natural Gas is natural gas that liquefies at -161 °C and shrinks to one six-hundredth of its volume in gaseous form.

LPG tanker

Liquefied Petroleum Gas is created as a carrier gas during crude oil and natural gas extraction. LPG is used as fuel for cars and sold in containers as butane and propane gas.

specialty," says Küver, "pipelines, compressors, pumps, the entire gas system including high-tech tanks – in short, everything you need to run this type of ship."

For the transportation itself, the cryogenic gases are chilled and liquefied. The flash point of petroleum is minus 161 degrees Celsius, ethylene boils at 104 degrees Celsius, and propylene at 48 degrees Celsius. The loading tanks are designed as pressurized containers and must therefore combine high stiffness and toughness. Cryogenic nickel steels are perfect for this type of low-temperature application, and since the late nineties, TGE Marine has been purchasing these products from ThyssenKrupp Steel Europe. These are highly specialized steels containing five to nine percent nickel. "The nickel increases

the toughness of the steel, so that it does not become brittle," says Lukas Korves, Head of Sales Export for the Heavy Plate Business Unit at ThyssenKrupp Steel Europe. "Normal steel would break immediately at the extreme temperatures used in liquid gas transportation." The steel must also have high stiffness. This property can be achieved using a special heat treatment and quenching method. "There are very few approved steel mills in Western Europe that offer this type of treatment, and we deliver premium-quality products in this area."

There is a market for these products – and that market is growing. Worldwide gas routes are changing, and freighters are getting larger. On top of that, environmental guidelines are

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becoming stricter, increasing demand for bunker vessels. In ECAs (Emission Control Areas), there are special limitations on soot, sulfur, and nitrogen oxide emissions. The Baltic Sea and the North Sea, including the English Channel, are two such zones. Starting in 2015, only ships with a maximum of 0.1 percent sulfur in their fuel will be able to enter these areas. For transport ships that otherwise run on heavy oil, this means either using extremely expensive synthetic diesel or the immense undertaking of installing flue gas desulfurization systems. The other option is to switch to natural gas, which does not contain sulfur, and can reduce CO₂ emissions by 25 percent, while blowing up to 85 percent less nitrogen oxide out of the ship's smokestack.

This is where the smaller-scale LNG tankers come into play, as they can serve to supply fuel to decentralized consumer ships and LNG bunker stations. "These distribution ships bring the LNG from large import terminals to – as I like to call them – satellite terminals," says Küver. "From there, it is fed into smaller industrial networks or used to fill up bunker vessels that, in turn, distribute the liquid fuel."

In the North Sea and Baltic Sea, many ferries and offshore supply ships are already using LNG for fuel. TGE Marine has just received a contract to build the first of these vessels: These ships, which will be 5,000 cubic meters in size and run on natural gas, will be used to fuel car carriers in the North Sea and Baltic Sea regions.

For more information on high-toughness nickel steels, visit <http://grobblech.thyssenkrupp-steel-europe.com/grobblech/en/produkte/ni-steel/>

The 'Mister X' of design history

Mauser has been producing steel pipe and modular furniture since the 1920s, and many of its products are considered classics.

The desk possesses a calm akin to that of a dependable machine that is just about to start up. A heavy table top rests on two black columns made from steel sheet, encircled in the middle by fine silver bands. The result is an elegant titan.

"This is a Mauser barrel-style desk from the 1950's," says Dieter Wiesemann, standing in the showroom of Mauser Einrichtungssysteme, located in the city of Korbach in central Germany. He is very proud. "Connoisseurs will spend €10,000 for this piece." Accompanying Wiesemann during our talk is Martin Metzting. Metzting works in Sales at ThyssenKrupp Steel Europe in Duisburg, where he is responsible for the EU division. He eyes up the massive piece. The desk was developed by the company's founder, Alfons Mauser, whose face has been immortalized in the bust featured in the neighboring room. Apparently, back in his day, he simply took the steel drums his company developed, placed them next to one another, and laid a board on top – and voilà, he became a design icon. "That's the legend, anyway," says Dieter Wiesemann. "I would put that table in my office too," says Metzting, who has clearly developed a taste for the style.

These two men have more in common than just their taste in office furniture. Dieter Wiesemann is Procurement Manager at the Vauth-Sagel group of enterprises, which belongs to office and contract furniture manufacturer Mauser. The steel that Mauser uses to build its industrial cabinets and innovative storage systems, such as the element.x series, is purchased in Duisburg, and in this case the customer-supplier relationship is older than the desk itself. In 1921, founder Alfons Mauser purchased a former carbide factory in Waldeck, locat-



60 years of Mauser design: Dieter Wiesemann (left) on a barrel-style table from the 1950's. Martin Metzting in front of a new element.x unit.

ed in the German state of Hesse, and in 1929 he began producing steel furniture there. The raw materials were supplied by Dortmund-based Hoesch, which became part of the Krupp Group in 1991 and then merged into ThyssenKrupp in 1999. The bond between Mauser and ThyssenKrupp Steel Europe is as solid and reliable as the steel that builds the foundation of their businesses. "This steel enables us to produce pieces with tight radiuses and fine shapes," explains Dieter Wiesemann, who has been at Mauser for 22 years. His counterpart, Martin Metzting, has worked for the Duisburg-based steel company for 15 years. "We have a good relationship," says Metzting. "But not too good," responds Wiesemann, with a laugh. The cold-rolled sheet metal is processed in Korbach at an expansive 28,000-square-meter production facility. 250 employees work at the facility, but large portions of the production have long been automated. Machines bend the steel sheet into cabinet doors, which are then

welded and painted by robots. Then the paint is fired in at a temperature of 180 degrees Celsius. Each day, the facility churns out ten truckloads of furniture – including different models of cabinets – which are then shipped to the same companies who have been ordering from Mauser for decades: solid, satisfied customers. Mauser's archiving systems are popular in libraries, museums, and businesses – in spite of the trend toward digitization and the 'paperless' office.

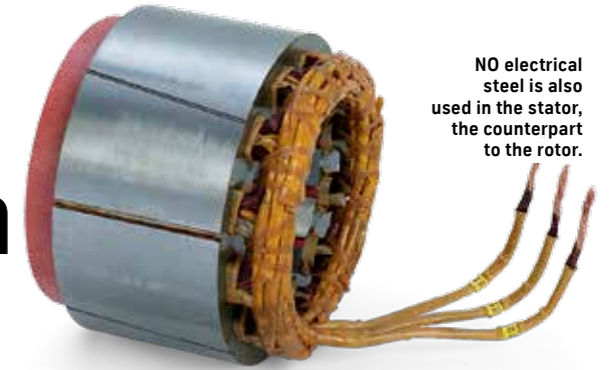
The strength and stability of Mauser's furniture naturally lies in the steel. Thanks to precise processing, this steel has allowed for incredible work to be done in the new element.x series. When pushed together and viewed from the front, the box-shaped modules form the 'x' that gives the series its name. The modules can be rearranged to form a variety of structures for public spaces, and very soon for private homes as well. This system shows what steel – and a long, productive business relationship – can create. — mm

High time to get things into motion

New types of electrical steel make it possible: The torque of the electric motor is increased, while a modified rotor shaft decreases the weight of the entire rotor.

Electric cars are an idea for the future, and electric motors have great potential, but the requirements for this technology are considerable: high speeds and increased torques, energy efficiency, lightweight and space-saving construction, and efficient resource management, to name just a few. As part of the InCar®plus project, ThyssenKrupp has successfully taken on the core of electromobility – the motor.

To increase efficiency, the team at ThyssenKrupp Steel Europe developed new high-strength and extra high-strength non-oriented (NO) electrical steels. "We refer to types such as 280-30 AP as high-strength. This means that they have a guaranteed yield strength of over 400 megapascals (MPa). For extra high-strength types such as the 500Y40-35HS, the yield strength exceeds 500 MPa," says Marco Tietz, expert in NO electrical steel grades in Bochum. In practice, these steel grades show lower magnetic flux leakage because the properties of this steel allow the magnets to be precisely positioned in permanent magnet excited synchronous ma-



NO electrical steel is also used in the stator, the counterpart to the rotor.

chines. "Using our material, it is possible to position the magnets near the very edge of the rotor, so that they can be used more effectively. This increases the torque and raises the induced voltage in the electrical machine. In addition, manufacturers can lower their costs without compromising on power and torque because less magnet material is required for comparable motor performance." But that's not all: "We also guarantee magnetic properties for higher frequencies, for example, above 400 hertz, together with guaranteed mechanical properties."

At the same time, engineers at ThyssenKrupp Presta Camshafts were working on developments to the rotor shaft of the drive motor. Thanks to the modular architecture of the product, they were able to introduce a hollow space inside the rotor shaft. This lowers the weight of the shaft and allows for multifunctional use. The shaft is surrounded by laminations produced in Bochum. "The rotor shaft and the laminations are designed to fit together perfectly," says Tietz. "The rotor is nearly two kilos lighter than competing models." First results from the test bench confirm the advantages of the electric motors of tomorrow.

— dsz

For more information visit <https://www.thyssenkrupp-steel-europe.com/en/innovations/developments/thyssenkrupp-incar-plus/thyssenkrupp-incarplus.html>

CONTACT



Marco Tietz and his team focus on the interaction between electrical steel and the final application. +49 234 508 51493 marco.tietz@thyssenkrupp.com

ThyssenKrupp Steel Europe knows all the right moves when it comes to non-oriented electrical steel.

Photos: Marcus Simalski (2), ThyssenKrupp Steel Photography (3)



“Knowledge creates ideas. Industry creates solutions.”

Hans Jürgen Kerkhoff, President of the German Steel Federation (WV Stahl), and Matthias Kleiner, President of the Leibniz Association, spoke in Berlin about the significance of research and the economy for our society.

Moderated by: Judy Born



Germany is considered to be one of the most innovative countries in the world. What is this reputation based on?

Kleiner: Innovation is based on research, especially on our intensive research of fundamentals, which has a long and deep-rooted tradition in Germany. This research has given rise to many innovations and made decisive contributions to many others.

Kerkhoff: What characterizes Germany’s industrial landscape is the interaction among the sectors. The supplier-customer relationship is not merely economic, but the partners also innovate together. This type of relationship can also exist between companies and between companies and institutes, both in the area of fundamental and applied research.

Kleiner: ...I concur. And it makes sense for you to raise this point, as you are also a member of the Max Planck Institute for Iron Research in Düsseldorf – a wonderful and unique combination...

Kerkhoff: ...yes, I think that is part of what makes this region so strong. We don’t think exclusively in terms of value chains, but rather in hybrid networks. And industry is an important driver for innovation in this context. This approach is a significant reason why Germany recovered so quickly from the crisis after 2009. It also ensures that we will remain competitive in the future.

Can this standard be maintained in the long term?

Kleiner: We can get even better, for example, in the area of strategic partnerships between science and industry. Science has become increasingly entrepreneurial, but I would like to see companies become more scientific. They are often preoccupied with optimizing their purchasing, with streamlining, and they are often very successful – but they rarely worry about generating new knowledge. It is important to invest in know-how for the future in a professional manner.

Kerkhoff: To do that, we need framework conditions that are adapted to the competitive situation. Fundamentally, there must be more understanding of industrial structures on the part of ‘political regulators,’ as I like to call the government.

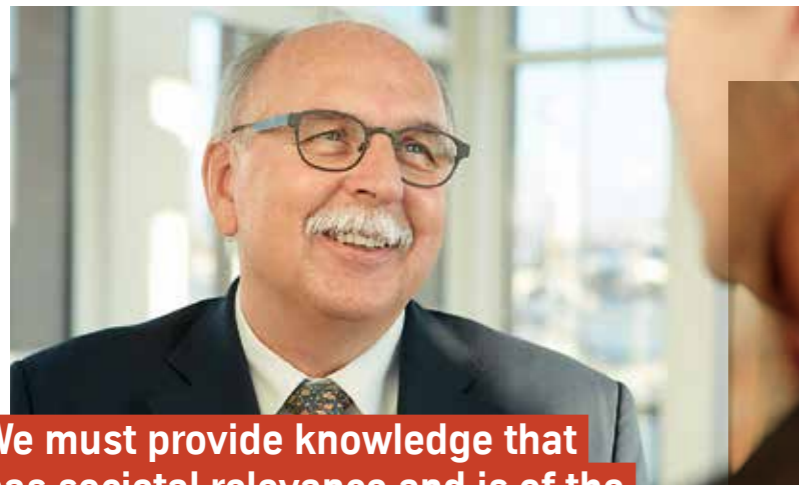
What do you mean, exactly?

Kerkhoff: We are presently leading a pretty heated debate with policymakers about CO₂ regulation. We have to make sure that measures in energy and climate policy do not endanger our competitiveness. One step in the right direction would be to pay more attention to life cycle analyses. Also, the positive characteristics of steel, which are especially evident in the application phase, as well as its recyclability, need to be taken into account.

Kleiner: Steel is an excellent example of the qualitative growth that we need in the area of innovation. Steel as it was 30 years ago cannot be compared with what is now commonly used in many applications.

Kerkhoff: And in this sense, companies are not simply suppliers of materials, but they also provide system solutions.

Kleiner: Which means that it is appropriate to talk about systemic relevance for our society when it comes to steel. I am convinced that we need to consolidate and further develop these sectors.



We must provide knowledge that has societal relevance and is of the highest quality.

Matthias Kleiner

How can research institutes or associations contribute to this?

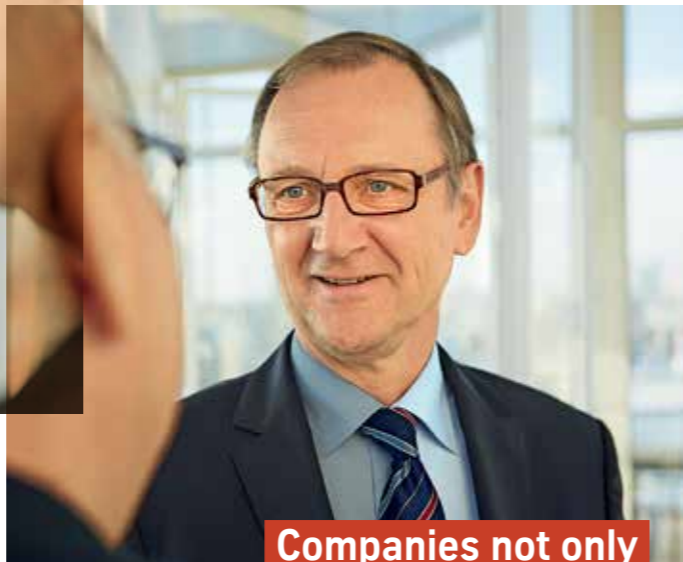
Kleiner: Research institutes first and foremost have to provide knowledge. This knowledge must be gained through excellent science and should focus on topics of outstanding social relevance. Science must be there for society. One reason why Germany is so innovative is the consensus on all sides that science, innovation, and market implementation go hand in hand.

Kerkhoff: An organization like the one I have the privilege of heading always has a communicative mission. On the one hand, we have to communicate the industrial reality to the policymakers – by this I mean the conditions under which the economy is producing. On the other hand, we need to analyze the effects of policy actions on companies and sectors and to draw conclusions about how we are to deal with them.

Do we have enough skilled labor that we can retain in the country?

Kleiner: At the moment, we are doing relatively well. Nevertheless, demographic developments will become a problem here, just like in other places. We have to work consistently to sponsor immigration and to create a more structured approach in this area. The rules in Germany are too arbitrary in this regard. We are also experiencing a great influx of refugees at the moment. Of course, our first priority must be to care for these people from humanitarian motives. But I also see an enormous intellectual potential for our country.

Kerkhoff: The demographic change also poses an important question concerning how we can manage to retain the knowledge we have gained through experience over the generations. But I also think that success draws people. This means that when we have outstanding, fascinating projects with long-term effects, such as electromobility or the fusion of digitization and industrial production, it will attract skilled workers and ensure that experts remain in our country.



Companies not only offer materials, they also provide solutions.

Hans Jürgen Kerkhoff

Let's return to the topic of the innovative materials industry: What significance does it have for the national economy?

Kerkhoff: Innovations are developed through the cooperation of many contributors, and when a link in the chain is missing, everybody will be affected. We've conducted a current-state analysis which showed that about 50% of all products that we export from Germany are steel-intensive ones – especially cars, machines, and plant equipment. Looking at the German export surplus, such goods even account for about 75%. Steel plays an important role in many fields that make us successful.

Kleiner: ...and let's not forget about renewable energies. Think of all the steel that's in wind power alone!

Kerkhoff: ...I agree. And it's in exactly that application that new types of steel help to reduce CO₂, for example. This is particularly evident in power plant construction. High-quality and heat-resistant types of steel are necessary ingredients for being able to produce energy in a sustainable manner. That's an important part of the process we cannot dispense with.

Kleiner: I would like to point out once again that it's not only about technical innovations in the natural sciences, but innovations that arise from social sciences and humanities also play an important part. Social innovations, if you will. Take the autonomous car, which, technically speaking, is essentially already a reality. But what are the social and legal framework conditions for its acceptance? Who will be held responsible when there is an accident, for example? For future innovations, it will be important to consider the questions that concern the social sciences and humanities as well as the engineering sciences.

People

Matthias Kleiner

is President of the Leibniz Association, a coalition of German research institutes covering a wide variety of disciplines.

Hans Jürgen Kerkhoff

is Managing Director and President of the German Steel Federation and Chairman of the Steel Institute VDEh.

Photos: Cem Guenes (2), MB (2), Jan Bitter, PR (4), ThyssenKrupp Steel Europe Photography

Dates

BAU 2015

19–24 January, Munich Hall B2, Booth 303

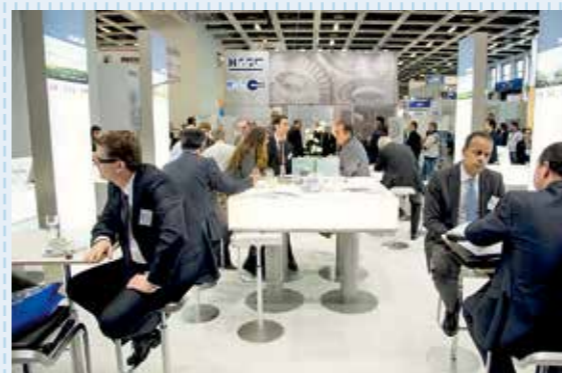
The international trade fair for architecture, materials, and systems provides the backdrop for ThyssenKrupp Steel Europe to present its innovative solutions from the Color area as a co-exhibitor at the Steel Information Center. Optically pleasing and functional surfaces part of the Pladur® brand, the ReflectionsOne® color range, and ReflectionsPearl® offer vast options for facade design.



CWIEME 2015

5–7 May, Berlin

For almost two decades, CWIEME has been the world's largest industry gathering for international vendors of coil windings, insulation systems, and electrical assemblies. More than 750 exhibitors from over 100 countries will present electrical equipment, insulations, and materials as well as the latest machines, products, and services in the area of coil windings. ThyssenKrupp Steel Europe will be in attendance as well, demonstrating its innovations in non-oriented electrical steel.



January

UPAKOVKA/UPAK ITALIA 2015

27–30 January, Moscow Hall 2.2, Booth 22 C24

This will be the 23rd annual international trade exhibition for packing machines, materials, and equipment held in Moscow. Whether the sector is food and drink, cosmetics, pharmaceuticals, or confection, the demands on products and their packaging and presentation are growing at a rapid pace. This fuels interest in innovative technologies and materials. As a partner of packaging manufacturers, ThyssenKrupp Rasselstein is represented at this industry event.



May

Steel Innovation Prize 2015

9 June, Berlin

Engineers, architects, inventors, designers, and craftsmen have until **15 January** to submit their ideas for consideration in the Steel Innovation Contest. In keeping with the many applications of steel, the prize will be awarded in four categories: 'Products made of steel,' 'Steel in research and development,' 'Steel in construction,' and 'Steel design.' The 'Climate protection with steel' special prize will be awarded for the innovation that best succeeds in using steel to save energy and materials and reduce CO₂ emissions.

June

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In his search for a suitable motif for the agenda interview, our photographer went above and beyond the call of duty. The roof of the building (left) in which the Leibniz Association has its headquarters provides a view over all of Berlin. The production work inside (right) was less spectacular: The audio and video recording equipment and all those involved were packed into the tightest of spaces.



Competition

What is the maximum allowable weight of a four-man bobsled?*

*(including steel runners, team, and equipment)

Drop us a line if you know the right answer!

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



Send your answer to: ThyssenKrupp Steel Europe AG, Heading: Competition compact^{steel}, 47161 Duisburg, Germany, or by e-mail to: compact.tkse@thyssenkrupp.com.

All entries must be submitted by: 20 February 2015 (postmark date). **The winner will be chosen at random from the correct entries. Employees of ThyssenKrupp Steel Europe and their dependents are not eligible. The judges' decision is final.** Note: Your personal data will be used for the purposes of the competition only.