

compact steel

Issue 03/2017

The thyssenkrupp Steel magazine
thyssenkrupp-steel.com

Diverse viewpoints

Construction systems made of steel enable building envelopes to be affordably designed in diverse forms.

engineering. tomorrow. together.



thyssenkrupp

10 Multifunctional – Facades today are much more than just the skin that clads a structure. Steel panels perform a structural function while also playing a key role in the design and energy efficiency of a building.



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MyRENZbox

Drop-off and pick-up – The MyRENZbox from Renz is a digitally networked mailbox that allows you to send and receive parcels day or night.

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Photos: Cover: Martin Scherag / Architekten Ingenieure Bllstein; Page 2: Martin Scherag / Architekten Ingenieure Bllstein; Helmut Wachter / 13 Photo; Frank Schinski / Ostkreuz; thyssenkrupp Steel Europe photography (2); Page 3: Catrin Moritz

CREDITS

Published by:
thyssenkrupp Steel Europe AG
Kaiser-Wilhelm-Strasse 100
47166 Duisburg, Germany
—
Tel.: +49 203 520
Tel.: +49 203 522 5102

Editorial staff:
Kilian Rötzer (legally responsible)
Communications
Marcus van Marwick
Head of Brand & Customer Communications
—
Christiane Hoch-Baumann
Brand & Customer Communications (Editor in Chief)

**Photographic department,
layout, and production:**
C3 – Creative Code and Content GmbH
Heiligegeistkirchplatz 1
10178 Berlin, Germany

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Please contact us to share your comments and suggestions:
compact.tkse@thyssenkrupp.com

Andreas Goss on ...

Reliability

It is better to lose money than trust", as Robert Bosch said in 1919. From a businessman's point of view that might initially sound incredible – after all, who wants to lose money? But there is a deeper meaning behind the statement: Reliability and trust are fundamental aspects of business dealings and in the long term more valuable than short-term success.

At **thyssenkrupp Steel** we have been a strong and reliable partner to our customers for many years. And we want to extend and further intensify these fruitful and diverse relationships in the future – particularly because we know that some of our customer sectors are also currently undergoing major transformations. To take this path we need to be able to tackle the continuing structural problems on the European steel market. This would become increasingly difficult to do on our own. So thyssenkrupp and the Indian Tata group have signed a memorandum of understanding with the aim of combining their European steel activities in a joint venture. The new company will be called thyssenkrupp Tata Steel and start operation at the end of 2018 after approval by the regulatory authorities. The objective is to create a strong number two on the European flat steel market.

Tata is our partner of choice for several reasons: Our businesses are a very good fit and our strengths lie in different, complementary product areas. The main locations in Duisburg, IJmuiden in the Netherlands and Port Talbot in the United Kingdom have good logistical links. A joint, extended production network will provide greater closeness to customers throughout Europe. Both companies have strong innovative capabilities: By pooling research activities we expect to be able to provide our customers with more targeted and intensive support to meet their challenges. And finally Tata's corporate culture is also a good fit:

Tata has been in the steel business for more than 100 years and – like us – stands for responsibility towards employees and society. To establish the joint venture we need a responsible partner who is willing to accept changes. And here in particular trust and reliability are essential.

The logic of a **joint venture** dictates that competencies are pooled, weaknesses eliminated and strengths enhanced. Key to the sustainable success of the joint venture will be continuously creating added value for our customers and focusing more closely on their needs. That is our aspiration and we will be judged by it.

Yours

Andreas J. Goss
CEO thyssenkrupp
Steel Europe AG



At a glance:

See pages 4–5 for an infographic on the planned joint venture

Way forward for Steel

thyssenkrupp Steel and **Tata Steel Europe** want to combine their businesses as their response to the volatility of the steel market. Read on for more information on the markets, product networks, and business areas in which the new **joint venture** will operate as a strong partner.

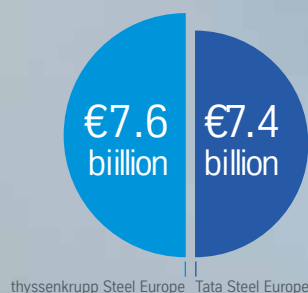


Headquarters

The holding company's registered office will be in Amsterdam, the Netherlands – the geographical midpoint.

Sales

Through the tie-up, the two companies will bring an end to the downward spiral of constantly introducing new programs to cut costs. Combined sales are projected to be approx. **€15 billion** (based on sales in the previous 12 months).



Automotive industry



Construction industry

Industries

The two steel companies complement each other well. thyssenkrupp has a stronger presence in the automotive industry; Tata is stronger in the construction industry and boasts industrial customers. Their respective main sites supply customers in various economically strong regions, covering a broad swath of business in Europe.



The joint venture
(from 2018)

Headquarters

Employees

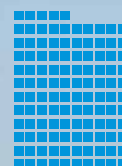
Locations

Sales

Shipping volume

Shipments

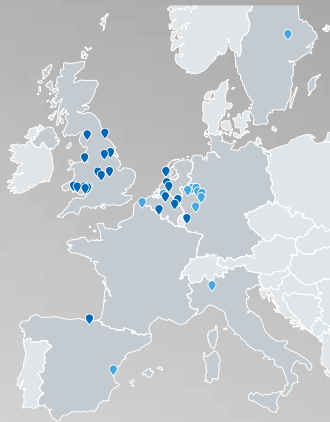
The companies aim to manufacture around **21 million metric tons of flat steel**, which would position the joint venture as a strong new number two on the European steel market, setting quality and technology standards.



approx. 11.5 million mt



approx. 9.8 million mt



- Location thyssenkrupp Steel
- Location Tata Steel Europe

Locations

The two companies have more than 30 locations in eight European countries, and they number among the highest-performing in Europe. Fully integrated plants in Great Britain, the Netherlands, and Germany perfectly position the joint venture for all possible consequences of Brexit.

Tata in figures

66

percent of the large Indian corporation of which our joint venture partner Tata Steel Europe is a part belongs to humanitarian foundations supporting educational, developmental, and environmental protection projects. A code of conduct calls for a respectful corporate culture.

\$100.4

billion: Group sales in 2016/2017.

70+

brands belong to the Tata Group, including classic car brands Jaguar and Land Rover.

695,000

employees work for the various Tata companies at locations in 100 countries.

100

subsidiaries in the energy, capital goods, telecommunication, IT, food and beverage, financial, real estate, and aviation industries belong to the Tata Group.

venture
Amsterdam
48,000
34
€15 billion
21 million mt/yr

The top five

flat steel manufacturers in Europe ranked by 2016 sales. The joint venture will come in as a strong, new number two.

	ArcelorMittal Europe	Tata Steel Europe	thyssenkrupp Steel Europe	Voestalpine, Steel Division	Salzgitter, Strip Steel unit
sales in € millions	approx. 24,000	approx. 6,600	7,817	3,623	2,394
Employees	approx. 80,000	approx. 21,000	approx. 27,000	approx. 10,000	6,062
Shipments (1,000 mt)	40,247	10,090	11,538	5,271	4,552
Major locations	Belgium, Luxembourg, Germany, France, Italy, Poland, and many others	Port Talbot (U.K.), Linmuiden (NL)	Duisburg	Linz, Austria	Salzgitter, Germany

Hunting for clues

Are we looking here at a summit meeting of elegant writing implements? Or maybe a collection of nozzles for the finest confectionery? Wrong on both counts, although there currently is a close connection to the food industry. We are looking here at the inside of what is known as a **ToF-SIMS spectrometer**. thyssenkrupp Steel uses this highly complex analyzer to examine, among other things, a new coating for the packaging industry.

Secondary ion mass spectrometry (ToF-SIMS stands for Time-of-Flight Secondary Ion Mass Spectrometry) can reliably detect the chemical components of a surface. It is therefore capable of providing information about the molecular composition of even the thinnest of layers. Commissioned by the Packaging Steel business unit, the research and development department in Duisburg is investigating tin-plated steel blackplate, known as tinplate, for use in packaging. The material in the packaging must be food-safe and resistant to corrosion, so that products can be stored in it for long periods of time. More importantly, the new coating must be based on an eco-friendlier chromium-free process.

thyssenkrupp Steel also uses the method in **developing new products**. The analysis technique can further be used to solve problems involving the production, storage, or transport of flat steel products. Incidentally, it is very unusual for a ToF-SIMS spectrometer to be deployed in the steel industry. These devices are mainly used in the semiconductor industry. But the technology has also drawn the attention of the Federal Criminal Police Office in Wiesbaden as a tool of searching for clues.





It can take a lot:
Here's an example
of how tough and
resilient steel
can be.

Successful performance for heavy plate

Heavy Plate has two new perform[®] grades in its portfolio, and XAR[®] 400 will also be offered as steel strip.

Materials from the Heavy Plate business unit are in demand wherever high capacities and wear-resistant properties are needed. thyssenkrupp is proud to announce innovations from two product families: The new perform[®] 960 is especially designed for the construction of mobile cranes, on-board cranes, and trailers. It is exceptionally strong, yet has excellent cold-forming properties. And perform[®] 700 is now also available by arrangement in a grade that is suitable for galvanizing (category A).

In the segment of wear-resistant XAR[®] steels, the XAR[®]400 has proved its value as an all-rounder. Service life can be increased several times over as compared to standard structural steels, depending

on what kind of abrasives are involved. Thanks to its hardness and ductility, the steel combines high resistance to wear with exceptional suitability for cold forming and welding. The XAR[®] 400 is now also available as steel strip. The product's outstanding surface quality makes it ideally suited for visible surfaces that are painted or high-gloss lacquered.

All three materials offer not only the possibility of weight savings, but also advantages with regard to cold forming, with very narrow thickness tolerances of ± 0.2 millimeters. The range of thicknesses and dimensions is still limited, but is constantly being expanded.

Contact: info.plate@thyssenkrupp.com
oder unter +49 203 52 75603

New grades make the chassis lighter

Lightweight construction and cost pressure has led to increasingly complex designs in chassis construction. For cold-formed components such as single-shell control arms, thyssenkrupp now offers an application-optimized material: the new CH-W[®] 660Y760T chassis steel. It offers much higher hole expansion capabilities and improved forming behavior, while remaining just as weldable as ever.

60 thousand

euros in prize money are at stake for the 2018 Steel Innovation Award. Three awards will be conferred in each of the four categories. The condition is that the projects must have been developed in Germany in the past five years.

Dates



UPAKOVKA 2018

23–26 January, Moscow

There is considerable interest in innovative technologies and materials for packaging. The Packaging Steel business unit of thyssenkrupp is a frequent guest at this international trade fair for packaging machines and the production of packaging materials. Companies chiefly present themselves at this event as partners of Russian and Eastern European producers of steel packaging.



TUBE 2018

16–20 April, Düsseldorf

International experts keep abreast of the latest developments in their field at the tube and pipe industry's international trade fair. The focus is on the pipe business and on forward-looking trends involving machines and facilities for manufacturing and processing pipes and pipe accessories. thyssenkrupp Steel and other subsidiaries will present new and innovative grades for the manufacture of steel pipes.

EUROSATORY 2018

11–15 June, Paris

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

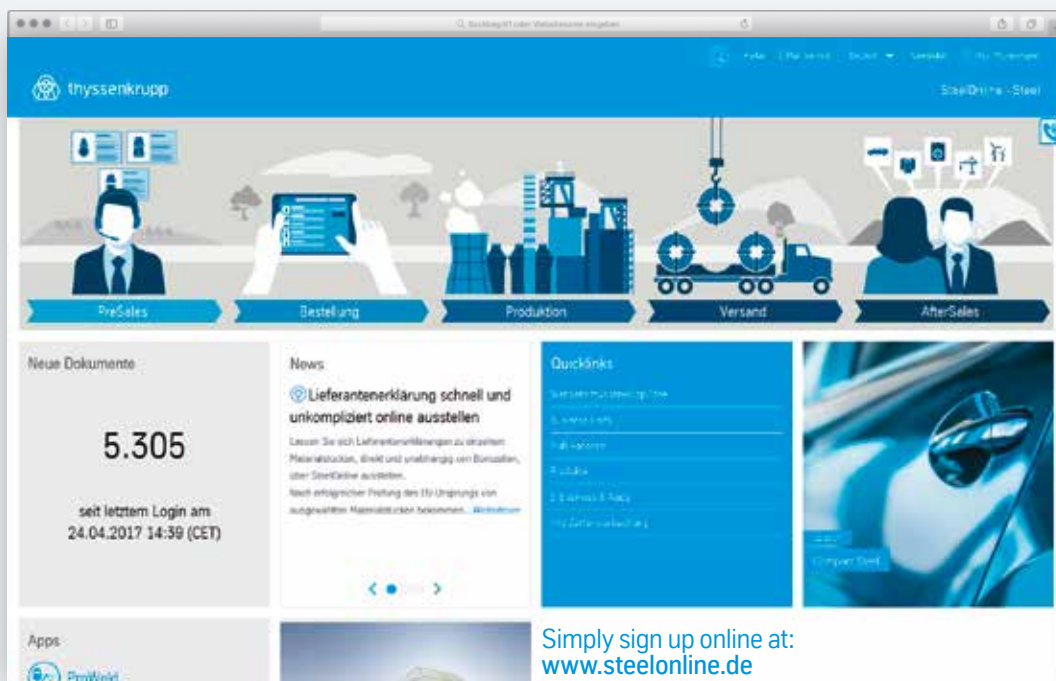


CWIEME 2018

19–21 June, Berlin

At the world's largest industry event for coil winding, insulation, and electronics assembly, the Automotive and Electrical Steel business units will present innovations for grain- and non-oriented electrical steel. thyssenkrupp Magnettechnik will also be exhibiting.

Photos: thyssenkrupp Steel Europe photography, PR (3)



Manageable and personalized: The home page of SteelOnline combines all of the main functions and helps save time.

Orders at a glance

SteelOnline is the digital customer portal of **all the sales areas in the steel business**. It now features a new design and offers customers even more information.

Fast, intuitive, and even more user-friendly: thyssenkrupp Steel's online customer portal now features a new design. For one thing, the service navigation area at the very top of the page now has a lot of new features; a search function and a language selector let customers access information quickly and conveniently. Then there's the personalized e-mail service, where customers can specify which application they want to receive information on automatically and how often – daily or weekly.

The graphical navigation is structured intuitively along the process chain to provide orientation. Required information, documents, and transactions can be found quickly here.

The approximately 700 registered customers of SteelOnline appreciate the full transparency in the handling of their orders, whether maintaining an overview of orders and production processes, scheduling deliveries as needed, or tracking shipments. Each customer can customize the SteelOnline platform individually. Key figures are now provided with graphics to make it easier to



Order

What is the job number for my order? Has an order confirmation already been submitted? Customers can find out here. Some suppliers are already starting to offer auctions, as well.



Production

The advantage of digital order processing is that customers can access up-to-date information on their orders at any time. With just a single click, they can view the production status of each item and obtain an overview of which items are already finished and available.



Shipping

Which items are ready for shipping? And which are already on the way? In this area, customers can play an active role in shipping by specifying desired quantities and preferred dates. Documents such as delivery notes and invoices are stored here.

recognize performance and trends. And a single glance is all it takes to see how many new documents are available for download. "We have repositioned ourselves technically for further applications with this customer platform," says Ansgar Heitkamp, Head of E-Business. "And we work with the highest security standards."

Want to become an online customer? We're happy to help: team.e-business@thyssenkrupp.com



ProWeld



ProWear

The right steel

Two online tools help customers choose exactly the right steel for the job. ProWeld provides information on weldability, while ProWear now also calculates the amount of wear and tear on a material depending on how it is used.



North Star School

Where: Frederikshavn, Denmark

Architect: Arkinord A/S, Arkitema Architects

Built in: 2013

Surface: Hot-dip galvanized, perforated steel sheet

Biomass combined heat and power plant

Where: Baumgartenberg, Austria

Architect: Gerald Anton Steiner

Built in: 2011

Surface: pladur® Basic

Ways of looking at a facade

Construction systems made of steel

enable buildings to be affordably designed and optimized for energy consumption. An integral part of the architecture is its color.



Text Judy Born

Who would have thought that a structure made of steel, of all things, would become the symbol of a metropolis, that a tower would one day come to symbolize an entire nation? Least of all its builder and namesake, Gustave Eiffel. After the Paris World Fair, his steel skeleton structure became the standard for building high-rises. It enabled buildings to grow to increasingly dizzying heights.

Almost 130 years and many building styles later, it's hard to imagine construction without steel, especially modern commercial, multi-story, and industrial construction. The demands are stricter now; construction is no longer determined by function and aesthetics alone, but by sustainability, too. Architects, engineers, and above all, manufacturers of building materials have a huge responsibility. Conservative use of raw materials and energy-saving production of supplies must be considered from the planning stage. The building should be erected and operated in the most environmentally and socially responsible way possible. Safety and fire prevention regulations obviously have to be followed. The goal is a short construction period with maximum useful life and cost-effective operation.

Steel structural elements can meet all those requirements. Demand for heat-insulated sandwich elements and trapezoidal profiles and curtain walls such as Siding Plus is rising in modern commercial and industrial construction. Last but not least, steel structures are easy to dismantle and up to 100-percent recyclable. But that isn't even necessary in many cases because high-quality corrosion protection keeps the building durable, while carbon steel available in every conceivable color and design guarantees it will look good for a long time. "We offer a very diverse range of design options in this area," says Axel Pohl,

Head of Sales, End-User-Industries at thyssenkrupp. "That goes for color, feel, texture, and design." thyssenkrupp offers customers carbon steel with paint or film coatings under the pladur® product name. Whereas the focus of the painted products is on color, luster, and texture, the film-coated products primarily aim for decorative impressions. "With our newly developed pladur® Impress line, we are now able to offer customers a previously unprecedented variety of designs." The advantage here is that the process no longer mandates a minimum order size in the thousands of meters. "As a result, we can now offer a broad customer base not only large batch sizes, but also smaller quantities tailored to the needs of the individual customer and the construction project."

One of those customers is Hoesch Bausysteme. The former component division of thyssenkrupp was sold to Kingspan Holdings of Ireland in 2012. "Our biggest business area is undoubtedly the production of sandwich panels," says Ulrich Reidenbach, Managing Director Sales at Hoesch Bausysteme. "But we are trying to cover building envelopes as completely as possible. As a result, we deal with insulations and even manufacture our own, for example, our new QuadCore™ insulation core, and we offer window and dome light systems." Apart from sandwich elements, the most common elements in steel construction are trapezoidal profiles and metal curtain walls, straight-line components that can be installed diagonally, horizontally, and vertically as ventilated curtain walls. "Sidings are easy to mount and offer a wide variety of design possibilities," says Reidenbach.

“We offer a diverse range of design options.”

Axel Pohl, Head of Sales,
End-User-Industries, thyssenkrupp





Private house

Where: Frauenfeld, Switzerland
Architect: Novum Bau AG 2016
Built in: 2016
Surface: pladur® Wrinkle

Gymnasium

Where: Cologne, Germany
Architect: Architektur-Ingenieurbüro Billstein (AIB)
Built in: 2016
Surface: pladur® Deluxe



Helmut Hachul holds the Chair of Metal Construction at the FH Dortmund.

Three questions for Prof. Dr. Helmut Hachul

You teach and do research on metal building envelopes. Why?

I'm fascinated by steel structures as an architect. Steel is extremely versatile. We can use it to do outstanding work in the area of lightweight construction and save resources in the process. I'm bothered by the fact that the focus has long been on cost efficiency rather than design. This is changing, thanks in part to companies such as thyssenkrupp and, of course, our graduates.

What edge do steel facades have over other materials?

They are extremely stable, lightweight, versatile, and resistant. The design possibilities are immense. But as with all construction methods, the design suffers when money is the main consideration. Buildings are the most sustainable things we build. They stand for an unbelievably long time in public spaces. The half-life of cars is much lower.

What will change for architects in the future?

Interdisciplinarity will increase. With regard to steel, we will plan buildings in the future with chemists, mechatronics engineers, and electrical engineers. There will be a lot of developments with coatings. Apart from that, cost-effectiveness, energy efficiency, and customization will get even more important, both in industrial construction and in urban and private buildings.



Three questions for Ulrich Reidenbach, Hoesch Bausysteme



The better the customer understanding, the more representative the results: Axel Pohl (l.) and Ulrich Reidenbach.

Your company once belonged to thyssenkrupp. How about now?

When thyssenkrupp decided to sell its business area for building components, the entire company was purchased by the Irish holding company Kingspan in 2012. The established and internationally respected name Hoesch Bausysteme was retained. While we do have a new parent company, we nevertheless operate as an independent brand.

What are the challenges facing your industry?

We often have lead times of less than three weeks. Short-term orders are not at all uncommon among our customers. For that reason, it is both our aspiration and a quality feature of our service to be able to offer short turnaround times and flexibility when delivering our facade elements, as well as suitable accessories for daylighting solutions, such as skylights, windows, and gutter systems.

What are the major challenges in the building trade?

Definitely digitization. Both in the building industry and the supply industry. Furthermore, ever-expanding requirements for thermal insulation and fire protection necessitate constant research and development work. A prime example of this is QuadCore, a newly developed foam system that currently offers the best insulating properties.



'Luther 1517' panorama

Where: Wittenberg, Germany
Architect: spreeformat
Built in: 2017
Surface: reflections Pearl

Administrative building

Where: Zuidland, The Netherlands
Architect: HDK Architekten
Built in: 2014
Surface: pladur® Wrinkle, pladur® Daylight

Office and factory building

Where: Schweinfurt, Germany
Architect: Schlicht Lamprecht Schröder
Built in: 2015
Surface: Patinax/Corten



Photos: Hoesch Bausysteme GmbH, Tom Schulte/Asia, thyssenkrupp (2)

One important quality feature of steel facades is their resistance to corrosion and UV radiation. The material also has to be very good to work with, because the paint is applied when the metal is flat, and then formed afterwards. This means the coating has to be formable and aesthetically pleasing, as well as resistant to wear. "And that's where we're needed again," says Pohl, "because customers like Hoesch take our semi-finished product and make their end product, which then appears on facades."

A lot of preparatory work is required before that point is reached. Architects and building contractors have to know the benefits of steel facades long before planning a building. Sandwich panels, for example, arrive at the construction site prefabricated. This minimizes er-

rors that might occur during installation. It also makes it possible to build things in a very short time. Sandwich panels have a high load bearing capacity and very good insulating properties, while complying with fire prevention requirements. In addition to architecture consulting, thyssenkrupp Steel offers planners and architects a special product folder that is still expanding and includes parts from the pladur® portfolio. The collection contains high-quality original samples and provides data on characteristics that make the materials especially useful for industrial and multi-story buildings.

Professor Helmut Hachul saw the potential at Dortmund University of Applied Sciences years ago. In 2006 he took over the Chair of Metal Construction, sponsored by thyssenkrupp, and in this capacity established a master's program in Metal Building Envelopes. He was especially excited by high-tech sheet metal. "A material that can be formed in many different ways, thereby gaining stability," says Hachul. "It allows components to have thinner dimensions and saves resources. And it's now possible to shape it in diverse ways."

Steel facades, and sandwich elements in particular, are hugely popular on the market. For students in Dortmund, this means that surfaces not only have to be shaped, but made more efficient as well. For example, there is research on integrating photovoltaics and solar thermal energy into the outer shell. "When raw materials run out, we'll need buildings that supply their own energy," says Hachul. In the area of surfaces, today's planners can select steel facades that radiate a certain atmosphere. "Architecture should serve people. I emphasize this because industrial buildings constitute large-scale architecture with tall facades that can be seen a long way off." There is a need for buildings that coexist in harmony with their environment. "My goal is to teach an approach to architecture that considers the residents who have to live with these buildings."

“
 We'll need
 buildings that
 supply their own
 energy.”

Helmut Hachul, FH Dortmund,
 Architecture Department

Contact: Axel Pohl, Business Unit Industry,
 +49 2732 59 94578, axel.pohl@thyssenkrupp.com

Batteries housed in steel

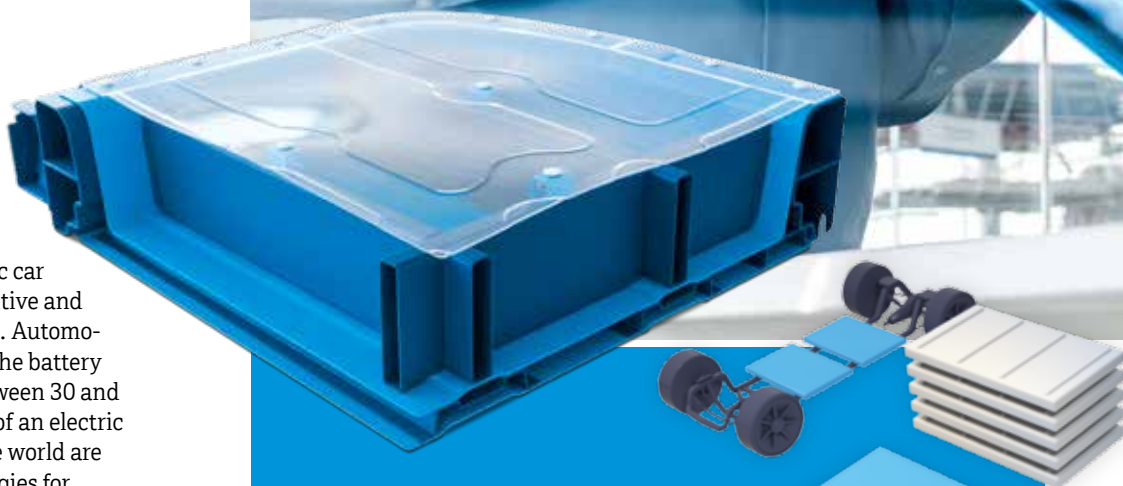
Lighter, safer, more economical: The **newly developed battery housing** from thyssenkrupp Steel weighs exactly the same as an aluminum version, but costs half as much – and protects the most crucial part of the electric car.

Text Christiane Hoch-Baumann

Photos Rainer Kayzers

The battery is both the definitive element of an electric car and its most sensitive and costly component. Automobile manufacturers expect the battery system will account for between 30 and 50 percent of the total cost of an electric car. Automakers around the world are currently working on strategies for expanding production capacities and supply infrastructures along the entire value chain.

At the interface between the powertrain and the structural elements, the battery presents both manufacturers and material suppliers with a complicated task from a conceptual standpoint. The top priority is to provide maximum protection for the core components of e-mobility, but the requirements have many layers. The battery has to be crash-proof and corrosion-resistant,



No doubt about steel

Weight – Weighs exactly the same as an aluminum reference model.

Price – Costs only around half as much.

Crash safety – Thanks to cutting-edge, high-strength materials.

Design – High-tech materials leave more room for the battery.

Other advantages:

- Better electromagnetic shielding against static/low-frequency fields.
- Fewer complex joining techniques.
- None of the delta-alpha problems of composite structures.

The battery housing, together with the installed battery unit and the control electronics, is a closed system with only a few interfaces, for example, to the electrical and cooling systems. This means it can be removed easily and repaired or replaced quickly.

The protective cover meets strict crash requirements, has a low sheet thickness, and reduces weight.



A housing that doesn't weigh things down: Andreas Untiedt and Daniel Nierhoff (left) have designed a crash-proof and cost-effective battery housing for electric cars.

for steel," says Andreas Untiedt, a customer project engineer at the steel manufacturer.

Untiedt, together with Nierhoff and a hand-picked team of experts, backed up his claim with evidence. "We built our solution on a computer, ran structural calculations, and verified the results with numerous simulations and real tests," Nierhoff reports.

Material properties connected with strength and deformation behavior were inputted into the software to enable the researchers to estimate how different types of steel affect crash behavior. Together with the carefully considered geometry of the housing, they formed the basis for the crash simulation. "The findings show that our new portfolio of ultra-high-strength dual-phase and manganese-boron steels are the ideal material for our component," says Nierhoff. The steels also underwent virtual cold- and hot-forming in line with the design requirements to ensure that the components can be manufactured. "And lo and behold, they're perfectly suited!"

More affordable than other materials

When compared with a battery housing made of aluminum, the 150-kilogram prototype made of steel performs every bit as well, and yet it costs only half as much. Another advantage of the steel battery housing is that liquid cooling can be integrated into its structure. In addition to scoring high on the key points of crash safety, space-saving design, low weight and hence longer battery range, the steel housing is also more cost-efficient than any other raw material.

"And thanks of course to our high-quality coatings, the component will be fully protected from corrosion, even in its highly exposed position on the underside of the vehicle," says Untiedt. "We have no doubts about our development and see it as an important part of our strategy for making e-mobility affordable. We're happy to present our design to customers."

Contact: Andreas Untiedt, Business Unit Automotive, batteriegehaeuse@thyssenkrupp.com

electromagnetically shielded, and cooled. The developers at thyssenkrupp Steel explored these aspects in depth and developed a virtual prototype that meets all of these requirements. The application engineers from Technology and Innovation in particular were instrumental in developing a lightweight and extremely robust battery housing with a modular structure that enables it to be adapted to a range of vehicle models. "Deformation of the battery must be avoided at all costs in the event of a crash," says Daniel Nierhoff of thyssenkrupp Steel's Technology and

Innovation department. On the one hand, the housing has to be capable of withstanding a side impact, a bump on the road, or a foreign object striking the battery housing from below without giving an inch.

The solution is high-tech steel

On the other hand, it has to be as light and compact as possible in order to make the most efficient use of the installation space and leave more room for even bigger batteries, which would offer longer vehicle ranges. "These competing requirements are no problem

Mission into space

Electrical steel from Bochum is built into the motor of a drill that will extract rock samples on the moon in the years to come.



Visions set on the moon: Taner Keser (left) and John Ransdell contribute to research on Earth's satellite.

When Neil Armstrong took mankind's first steps on the moon on 20 July 1969, he immediately put a little bit of moon rock in the pocket of his space suit. He wanted to make sure that at least a small sample would travel back with him to Earth, even if the mission of the Apollo 11 had to be canceled prematurely.

Soil and rock samples provide information about the age of the moon, the composition of its surface, how long it had active volcanoes, and how its interior is structured. The samples enable conclusions to be drawn about the formation of the moon and the evolution of our solar system. Sand, dust, and rocks are relatively easy to gather, but the situation is more complicated with large boulders or lower layers of soil. Without the right tools, it simply cannot be done.

Electrical steel in space

Moon rocks that were brought to Earth by the Apollo and Luna missions in the 1970s are still being studied today. No new samples have been added to the collection since then. But that's about to change. Within the next three years, a new rock drill will fly to the moon. And it will be powered by a motor that contains electrical steel from the thyssenkrupp plant in Bochum.

"This is truly an exceptional opportunity for us," says Taner Keser of the Business Unit Automotive. "And admittedly it's also a big accident." The

deal was made possible by RUAG Space, which has been an active player in the aerospace industry for over 40 years. The Swiss company develops and produces complete modules for satellites and carrier rockets. "We build lots of movable components, for which we require motors with special properties," says John Ransdell, project manager at RUAG Space, during a conversation in Zurich. "An electric motor without steel as a raw material is unthinkable. It's the magnetic properties of electrical steel that make it possible to manufacture generators and electric motors in the first place." The material that was required in this case had to be exceptionally thin, so that a high level of efficiency can be achieved. "That's where we come in," says Keser.

The need to minimize weight is especially urgent in space travel. Cost-effectiveness is at the very top of the list of requirements. Each kilogram that has to be carried into near-Earth orbit generates an average of \$10,000 in costs. "So it's self-evident that every component should be designed to be as small and efficient as possible," says Ransdell. Temperature fluctuations pose another challenge on the moon, because there is no atmosphere to keep things stable. The temperature can range from +180 to -180 degrees Celsius, depending on the location. "In the first place, the mechanism and motor have to be able to withstand such differences," says Ransdell.

If new soil samples extracted from the moon were to show that there is an underground water reserve hidden on Earth's satellite, the discovery would make it possible to operate a manned moon station at substantially lower cost. Drilling equipment that works in space could also one day be capable of tapping into sources of rare, industrial raw materials, whether on the moon or on asteroids.

The nine famous moon missions brought a total of nearly 400 kilograms of rock samples back with them to Earth. 22 of those kilograms were gathered in 1969 by Neil Armstrong, Buzz Aldrin, and Michael Collins.



The highest demands for mostly small sales volumes: Taner Keser (left) listens as John Ransdell explains the complicated matter of aerospace production.

On a mission with RUAG

The RUAG Group is a Swiss technology company that plays an active role in aerospace and other industries. RUAG Space is divided into four different areas: structures and separation systems for launchers, structures and mechanisms for satellites, digital electronics for satellites and launchers, and equipment for satellite communication.

RUAG Space is also firmly established in the area of commercial space travel, as well as in the institutional programs of the European Space Agency and the European launcher program, known as Ariane. RUAG Space's computers control and monitor most European missions.

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The material for
the rock drill had
to be exceptionally
thin. And our
electrical steel fit
the bill.”

Photos: Helmut Wachter

Taner Keser, Business Unit Automotive,
Bochum, Germany

Contact: Taner Keser, Business Unit Automotive,
+49 234 508 51539, taner.keser@thyssenkrupp.com

Mailbox 4.0

A **smart package station** made by Renz GmbH aims to improve delivery service. And thyssenkrupp is the perfect partner for materials.

Text Johannes Arnold
Photo Wolfram Scheible

The requirements for mailboxes seem manageable at first glance. They should look impressive, withstand all types of weather, last as long as possible, and offer plenty of space for packages. But customer requirements are becoming increasingly complex and have changed fundamentally in recent years. "Fewer and fewer traditional letters are ending up in our mailboxes these days," says Armin Renz, who runs the third-generation family business of the same name. But e-commerce is on the rise. Whether clothing, technology, books, or even food, everything is ordered online. But before reaching their recipients, most packages are left with neighbors or at remote package stations. Retrieving them is troublesome and time-consuming.

Trust through exchange

Erwin Renz Metallwarenfabrik gave a lot of thought to this digitization issue, and in 2015 the company unveiled a next-generation mailbox that solved the problem: the 'myRENZbox.' This intelligent package box for single- or multi-family houses and company headquarters is connected to the Internet. As a result, package delivery companies can access the box and leave the package right at the recipient's home or place of business. A message is sent to the recipient immediately via e-mail, text message, or the myRENZbox app. They can then pick up their package at any time, using a PIN code, transponder, or Bluetooth connection to the app. And if they aren't satisfied with the contents,

they can send the package back via the myRENZbox – a clear gain in time and convenience. That's why Renz has already won two awards for its innovation: the 2017 Smarthome Award and the 2017 Digital Leader Award.

A system such as myRENZbox offers enormous potential, including for thyssenkrupp. After all, the steel for the doors and housing comes from Eichen and the pieces are finished in Mannheim. "We offer uncompromising product quality," says Raimund Grüttner, purchasing manager at Renz. He has been at the company for more than three decades, during which time thyssenkrupp has produced the steel for these products and formed them individually for Renz at the Group's Service Center. The long-standing relationship of trust, which is well past celebrating its silver anniversary, is ultimately the result of close communication between three partners working together.

"The constant communication is extremely important," says Achim Peuster, who is responsible for the

The 'myRENZbox' for companies

Renz has integrated the delivery processes of DHL and ParcelLock (Hermes, DPD, GLS) into the software of the package box. As a result, it can be used for both receiving and sending packages. That makes the myRENZbox interesting not only for individuals, but for companies, too. In the commercial sector, it is currently being used successfully in connection with pickup processes for ordered products, mail distribution to employees, and intralogistics.

Package delivery made easy (from left): Made possible by a successful collaboration between Armin Renz, Achim Peuster, Raimund Grüttner, and Bernd Tremmel.



At Renz, the orders are completed to the customer's specifications. This front combines a bell and mailbox system.



You've got mail: When the courier places a package in the myRENZbox, the recipient receives a notification via text message or the app.

primary material in thyssenkrupp's Business Unit Industry. That's because the large quantities of steel from the plant in Eichen have to be assembled flawlessly and delivered at the right time to Renz's production facilities. "Otherwise, the machines stand still," says Grüttner. This is where the team from thyssenkrupp Materials Processing Europe in Mannheim plays a decisive

role. Branch manager Bernd Tremmel: "Our job as a Service Center is to take the steel delivered from the plant, cut it to size, and deliver it promptly to the customer." The focus is on parameters such as tolerances for thickness and width, but a flawless surface coating is also important. For example, Renz has settled on thin sheet coated with Galfan to ensure that the mailboxes and package boxes remain highly durable in the long term.

Armin Renz is confident that the need for networked, 24/7 accessible boxes like the myRENZbox will become far greater. "We have a job ahead of us in the next few years!" The well-coordinated team at thyssenkrupp and Renz is ready for it.

Contact: Achim Peuster, Business Unit Industry, +49 203 522 5556, achim.peuster@thyssenkrupp.com



Gold in Korea?
Luger Toni Eggert
is fully focused on
achieving his goal.



Negotiating the curves on thin steel runners: The blue bridges on which the steels are mounted are roughly as wide as the length of a finger.

Blades and sled ready!

When Toni Eggert is racing down the icy track at speeds of up to 140 kilometers per hour, **he has to know he can trust his partners.** This includes his teammate Sascha Benecken and thyssenkrupp, who provides development support.

Text: Judy Born
Photos: Frank Vinken

Toni, how did you come to team up with thyssenkrupp in building your two-man luge?

Toni Eggert: Herbert Schneevoigt is the person who originally brought us together. He was also part of the team that helped set up the thyssenkrupp plant in Ilsenburg. Unfortunately, this year he passed away. I knew him quite well. My grandfather and Mr. Schneevoigt actually competed together in doubles luge when they were young. He was also the one who introduced me to the crew at Components Technology in Essen and Alex Meier at the TecCenter for Drive Technology in Liechtenstein. That was back in the summer of 2014.

What are the key aspects of the collaboration?

Eggert: We were able to draw on the full range of expertise thyssenkrupp has in technology, materials, and processes. This allowed me to find the perfect steel to use for our sled's blades. When I know exactly what the blades should look like and what they should offer in terms of performance. Having many years of experience gives me the knowledge necessary to know what type of material I need to make them.

What is the most important property when it comes to the steel?

Eggert: The frictional resistance should be as low as possible. That is absolutely key in competition. As little resistance as possible allows you to achieve the highest possible speeds.

Why did you ultimately opt to go with heavy-plate steel from thyssenkrupp?

Eggert: Along with its low resistance, the other main advantage of the material is that I can work with it without having any other steps involved. That means I don't have to subsequently harden and temper it, or apply a surface coating. Other steels that were up for consideration are generally coated. There is real disadvantage to this, in that it is often not possible to bend it, make holes in it, or treat it in any other way after the fact. If I were to do that, the coating would peel off, thus rendering the material useless.

Michael Linnepe: Have you ever encountered any problems with surface defects?

Eggert: No, never.

Since we are biased in this case, we will not mention the material you are using...

Eggert: No, please do! I will just say this: The steel is highly resilient and sturdy, and it is incredibly easy to work with. To illustrate: If we

The true measure of success in the sport – the blades

Several steps are required to take the geometry of an object and create a precise 3D model of it.

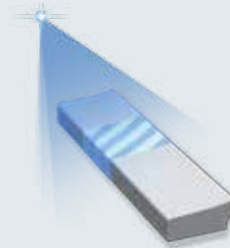
1 Preparation

A matting spray is applied to prime the blade to avoid reflections.



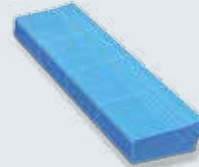
2 Scanning

A camera-based system scans the blade millimeter by millimeter.



3 Modeling

Once the blade has been fully scanned, the measuring tool can then generate a 3D model of it.



4 Milling

The collected CAD data can now be used to mill a basic blade out of the chosen material.



Support in the form of information: thyssenkrupp provides the athletes with high-quality material as well as knowledge and expertise.



Technology is key in sports: Toni Eggert (top left) is grateful for the support he's received from Michael Linnepe from thyssenkrupp Applications Technology.

On the dot: The markings are used as reference points by the scanner.

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Once the blade is scanned, we can then optimize it in the future.”

Michael Linnepe, thyssenkrupp
Application Technology in Duisburg

happen to run over a small pebble, this does not cause cratering in the steel. All of these properties, in combination with the low frictional resistance, make the steel from thyssenkrupp the perfect material for the job.

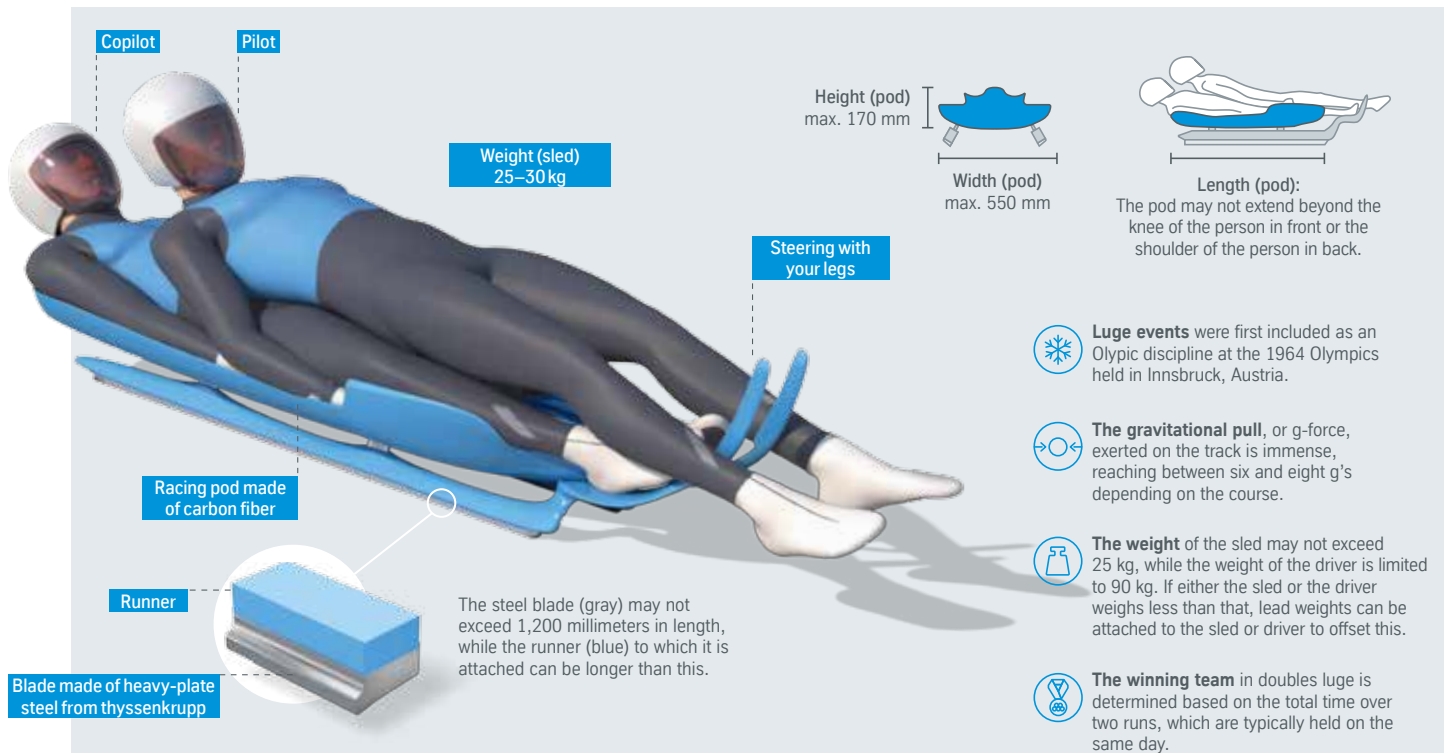
Mr. Linnepe: In what other ways is the Steel division able to offer support?

Linnepe: The most minor of modifications made to the steel blades are what ultimately make the difference. To gain an edge in competition, we used a tool to measure and scan the geometry of the current blades millimeter by millimeter. In theory, it would be possible to use this data to further optimize them in the future.

You say in theory. Why aren't you doing this?

Linnepe: We would need a special tool to do that. It's called a 5-axis milling machine. With it you can enter the CAD data gathered from the measurements and produce the blades to your precise specifications. And that's not all. The 3D model allows you to not only create exact copies of the blades, but also to further optimize them as well. A machine like this does come at a cost though – and we don't have that kind of money lying around. But it would be the next logical step. The milling tool, together with Toni's experience, would allow us to be prepared for any weather or track conditions at the particular course and create the right blades based on these conditions.

Eggert: That would be amazing. Under ideal circumstances, I'd enter my personal reference values, and the rest of the parameters would



Luge as an Olympic discipline

Here are some fun facts about the luge, the track, the course chosen for the South Korean Olympics, as well as a few of the rules.

automatically be adjusted to match them. At the end I'd have a finished CAD model ready to be milled. That would save me at least two months' work. I've been doing this all by hand up to now.

It really takes you that long to produce a new blade?

Eggert: Yeah, that would be the bare minimum. And once the part has been milled, I then need to bend and adjust it. The blade is next fixed onto the runner using putty and the groove ground into it. This takes roughly two months. Only then am I able to start initial testing on the track. Over the weeks to follow I experiment and try to find the best setup. This could mean sharpening or rounding the blade, depending on the track conditions. In reality, they're never really finished.

Where and when do you test them?

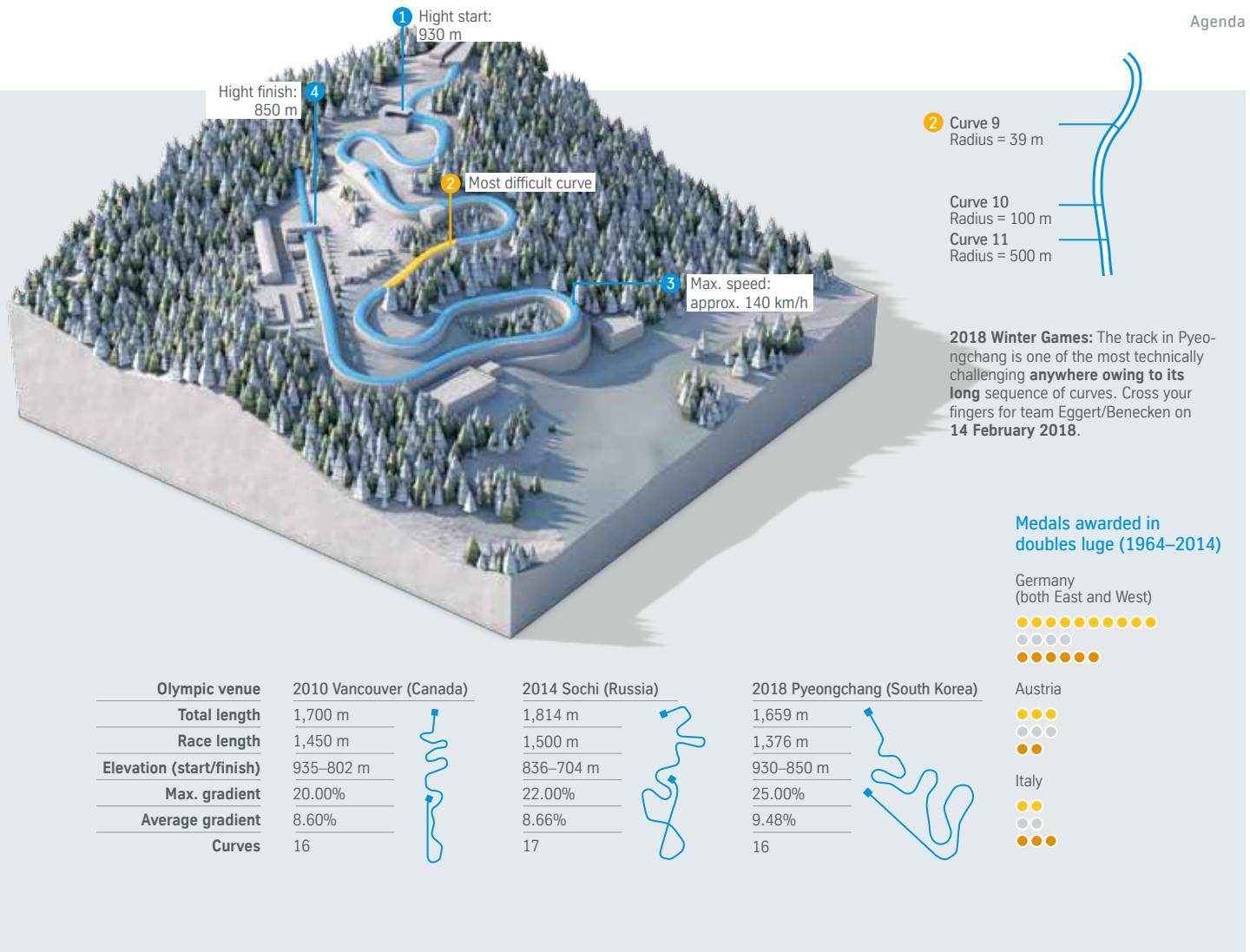
Eggert: We train and travel with the German national team for four to five weeks during the winter. In the time leading up to the World Cup, we do five practice runs. This allows us to make adjustments to the sled to adapt to the conditions on the course.



Reasons to celebrate: Toni Eggert and his teammate Sascha Benecken won the overall World Cup doubles luge title in the 2016/17 season.

“thyssenkrupp produces the best steel for the blades on our luge.”

Toni Eggert, luger on the German national team



Is it any advantage for you in knowing the tracks from past races?

Eggert: No, not really. It may sound like a cliché, but every race is different. First off, temperature is a key factor. At -15 °C, you will need a completely different edge than you would at 10 °C. And even though the ice is artificially chilled, the surface is softer at that temperature than it would be if it were below freezing. When the race is held also plays a role. At the end of a season, the ice on the track is much thicker than at the beginning. The crew maintaining the course sprays water on it to increase the thickness of the ice and decrease the radius of the turns.

Do lugers generally build their own sleds?

Eggert: No. At the moment, I don't think there is anyone else who is as involved in the process as we are. Some athletes work with mechanics when building their sleds, but most teams in Germany make use of the services of the FES Institute for Research and Development of Sports Equipment who provide them with the materials they need. The mechanics and coaches only perform fine-tuning on the sled in collaboration with the athletes.

This makes having outside support that much more important...

Linnepe: Absolutely. The first step for the Applications Technology team at thyssenkrupp Steel involves a transfer of know-how. This time, it's not a carmaker but an athlete who we've working with. The next step is to copy the current geometry and reproduce it in a new part. This makes it possible to use the generated data to adapt the blades to any conceivable conditions.

Toni, when did you first become involved in the sport?

Eggert: I was 11 at the time. My father and grandfather were both involved in the sport. Back in 1988, the year I was born, my dad was on the Olympic team, but had to pull out due to an injury. Later on, when I was a kid, we would always watch the races together. I would see the trophies at home, and one day, I wanted to give it a try myself.

How much longer do you want to compete?

Eggert: I want to retire after the 2022 Olympics in Beijing, if I'm able to qualify. My original plan had been to leave the sport after the Games next year, but things are going so well at the moment.