LINE PIPE GLOBAL

www.magazine.mannesmann-linepipe.com

MANNESMANN
LINE PIPE
A Member of the Salzgitter Group

Issue 14 · May 2022

Green Gases: Hydrogen and Ammonia

Safe Storage, Efficient Distribution, Carbon-Neutral Application

Also available online!

magazine.mannesmann-linepipe.com

Dear Reader:

Green hydrogen has become a familiar term to most of us. But what green ammonia is all about is explained on the following pages. The focus of this issue is on the safe storage, efficient transport and carbon-neutral application of these 'green gases'. Because they make an important contribution to the success of the energy transition.

The energy transition, low-carbon business and climate change are now central aspects of numerous projects, if not the very reason for them. On the Dogger Bank, for example, the world's largest offshore wind farm in the British North Sea. And at Volkswagen in Wolfsburg, where the energy supply of the future has been launched for the mobility of tomorrow. The future of mobility is also on the agenda in Baden-Württemberg, where climate-friendly road freight transport is being studied in an 18 km long real-life laboratory on the B 462 highway.

Municipal utilities and regional suppliers are also looking closely at the effects of global warming. In the reports on Franconia's arid plain and the Vendée, a department in the west of France, you can find out how different the approaches to solving the impending problems in the water supply sector can be.

What all projects and their participants and clients have in common is the will to address the issues associated with climate change and the energy transition. In all this, it is our aim to support our customers and assist them in word and deed. Like the innovative Spanish engineers at Nabrawind, who have practically turned the erection of onshore wind turbines on its head – with HFI-welded tubes from Mannesmann Line Pipe.

I wish you an inspiring and enjoyable read.

Andreas Betzler

Managing Director

Contents

Title story

Green Gases

The importance of green hydrogen for the energy transition is undisputed. Now on the agenda is the production and application of ammonia as the second green gas. For both, Mannesmann Line Pipe already has products and solutions ready for use today: for efficient transport, safe storage and carbon-neutral application.

Renewable power generation continues to struggle with two serious problems: volatility in its production and timely cost-effective distribution over a wide area. Both problems can be solved with green hydrogen. Study findings and research projects have now spawned large-scale projects.

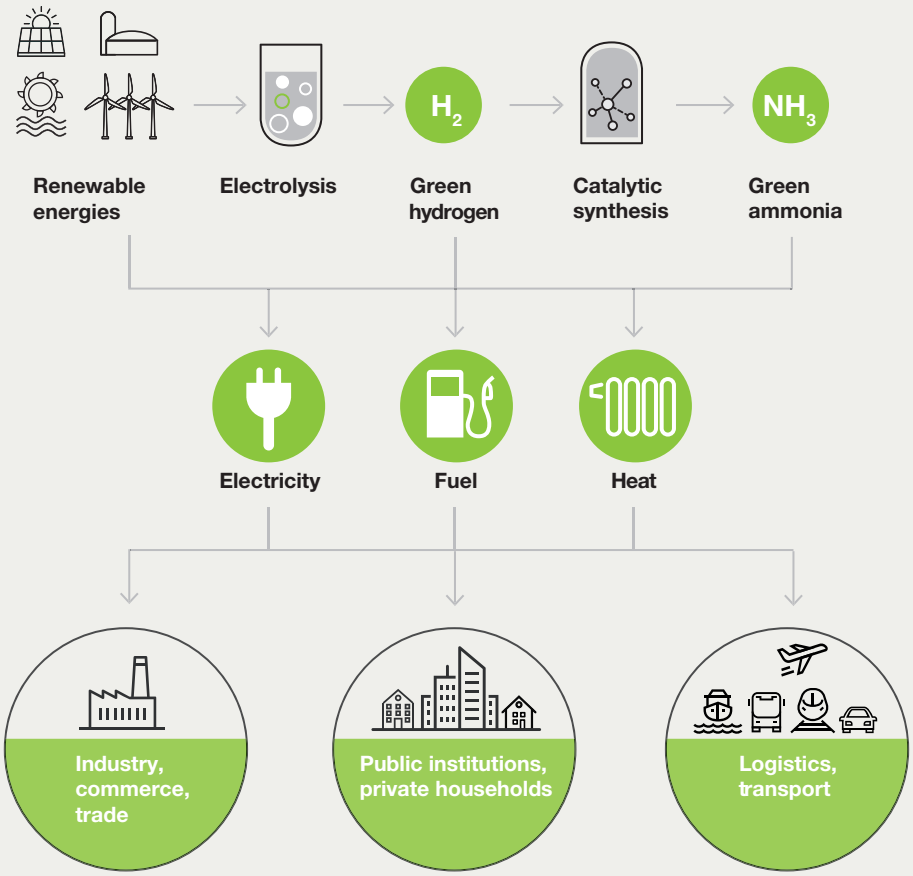
Production on the industrial scale

Numerous big-name industrial companies, plant manufacturers and energy companies are devoting themselves to the production and application of green hydrogen. On the site of Energy and Chemicals Park Rheinland in Wesseling near Cologne, for example, Europe's largest PEM electrolyzer for the production of green hydrogen went into operation in the summer of 2021. The 10 megawatt plant will produce up to 1,300 metric tons of green hydrogen per year, and a 100 MW plant is already in the pipeline. Industrial gas producer Linde is set to commission a 24 MW project in Leuna in 2022. BP and Ørsted, world market leader in offshore wind energy, are jointly planning a 50 MW electrolysis plant on the site of the BP refinery in Lingen. And Siemens Smart Infrastructure has also entered the green hydrogen production market by teaming up with "Wun H2" to produce up to 1,350 tons of green hydrogen annually in Wunsiedel, Bavaria from mid-2022. The AquaVentus project aims to produce green hydrogen at sea, right where the energy for it is generated. Electrolysis plants with a total volume of 10 gigawatts are planned by 2035 and would be capable of producing up to 1 million tons of green hydrogen and distributing it via pipelines.

Salzgitter AG – green hydrogen for green steel

Salzgitter AG is already moving into concrete application mode with green hydrogen. In addition to a PEM electrolyzer, Salzgitter AG operates the world's largest high-temperature electrolyzer, using the waste heat from

Importance of renewable energies and green gases for the energy transition



Mannesmann H2ready®

The mechanical and technological properties of our steel pipes, specially developed and qualified for the transport of hydrogen, exceed the requirements of the EIGA guideline. For long-term resistance to transported hydrogen, the inner surface is supplied free of surface offsets (in compliance with ISO 3183).

Efficient transport

Safe storage

Carbon-neutral application

Furthermore, any internal points of attack for the hydrogen are minimized by guaranteeing phosphorus and sulfur levels lower than those specified in the EIGA guideline. The also further reduced carbon equivalent ensures excellent weldability. For greater freedom of pipeline design, we offer grades up to X70 (according to API 5L) and L 485. If required for the order, a material's suitability for the hydrogen atmosphere can be proven in a comparative test.

steam from steel production. In this way, the first green steel components are already being produced today and are used, for example, by Miele and Mercedes-Benz AG (for further information, see page 7).

Hydrogen versus ammonia

But alongside numerous advantages, hydrogen also has its drawbacks. And this is where ammonia takes its cue. Ammonia is the world's second-most common basic chemical, a compound of nitrogen and hydrogen. Until now, 80% of ammonia has been used as a fertilizer, but because it is combustible, it could also be used as an energy source in fuel cells. It burns to form nitrogen and water and, in its pure form, is not itself a climate gas. Ammonia has several advantages over hydrogen, one of them being that it liquefies at -33°C, compared to hydrogen only at -253°C. Its vapor pressure at 20°C is only 8.6 bar. In addition, it has a significantly higher energy density than hydrogen, ignites less readily and is less explosive. The gas is therefore comparatively easy to liquefy, transport and store.

But the production of ammonia is also highly energy-intensive. Green ammonia is produced by catalytic synthesis from separated atmospheric nitrogen and green hydrogen and loses efficiency in the process. In the electrolysis of hydrogen from wind or solar power, the efficiency is 70 to 90%, depending on the process. Due to the conversion to ammonia, the overall efficiency through to conversion back into electricity – in a steam power plant, for example – is then only 55 to 60%. So in fact it makes more economic sense to use renewable energy directly or to store it in the form of green hydrogen. However, ammonia scores with its simpler handling, transport and storage. This could be of benefit to shipping, for example,

Award-winning hydrogen production: Europe's largest PEM electrolyzer for the production of green hydrogen in Wesseling received an award from EnergyAgency.NRW as an 'innovative climate protection project'.
Image: © Shell

which currently mainly uses bunker fuel – the cheapest and most harmful fossil fuel of all.

Hydrogen transport via natural gas pipeline

Germany has a 50,000 km high-pressure natural gas network. Utilizing this existing infrastructure would enable a prompt and smooth transition to a decarbonized heating sector. Especially when one considers that the natural gas distribution network across the country as a whole is even about 500,000 km long.

In the European context, Germany's National Hydrogen Council* (NWR) therefore sees hydrogen transport by pipeline as the most economical option for distances of up to 10,000 km. Other advantages are that the use of existing infrastructure would reduce system costs and accelerate implementation, and social acceptance would certainly be very high.

Initial tests have yielded very promising results. For example, E.ON subsidiary Avacon is testing the admixture of hydrogen in a subnetwork in Saxony-Anhalt. Together with the German Technical and Scientific Association for Gas and Water (DVGW), the company wants to demonstrate that it is technically possible to feed a percentage of hydrogen significantly higher than previously envisaged into an existing gas network. Equipment and plant do not have to be modified in the first step of this process.

"And just as for the cost-effective transport, safe storage and carbon-neutral application of hydrogen and ammonia as green gases, a wide range of products is also available to our customers in the field of carbon capture and transport."

Konrad Thannbichler,
Mannesmann Line Pipe Head of Sales

New distribution networks already being planned

The purpose of the "H2.Ruhr" infrastructure project is to set up a distribution network in order to supply municipal, medium-sized and industrial companies in the Ruhr region with carbon-free hydrogen and green ammonia. By 2032, up to 80,000 tons of hydrogen per year is to be made available to regional customers between Duisburg and Dortmund.

Hydrogen storage in caverns

The total capacity for injection and withdrawal at German gas storage facilities is around 23 billion cubic meters of gas. Whether and how these storage facilities can also be used for hydrogen storage is being investigated in a pilot project run by the energy utility EWE AG. The safe storage of 100% hydrogen is to be tested and demonstrated in a 500 m^3 cavern in the salt dome in Rüdersdorf, Brandenburg. Findings from the project could then be scaled up to large cavern storage facilities.

Keeping carbon capture and storage in mind

As green gases, hydrogen and ammonia will clearly play an indispensable role in the success of the energy transition. But carbon capture and storage (CSS) will also be a big factor in the decarbonization of the industrial and energy sectors. With CSS, it will be possible to capture and permanently store up to 95% of the carbon emissions generated by the

As part of the AquaVentus project, Helgoland is to become a carbon-neutral hydrogen hub in the North Sea and the starting point for a liquid organic hydrogen carrier (LOHC) supply chain.

Visualization: © Jakob Martens/ TransHyDE Projekt Helgoland

In Brevik, Norway, HeidelbergCement is to build the world's first industrial-scale carbon capture and storage facility in a cement plant. The plant is scheduled to go into operation in 2024 and capture around 400,000 tons of carbon per year.
Image: © HeidelbergCement/Norcem

burning of fossil fuels for power generation and in industrial processes.

The technical processes are proven and are suitable for practical use. In Brevik, Norway, HeidelbergCement will build the world's first industrial-scale carbon capture and storage facility in a cement plant. Starting in 2024, 400,000 tons of carbon dioxide will be captured annually and transported for permanent storage. This would reduce carbon emissions from the cement produced at the plant by 50%.

This is why Mannesmann Line Pipe Head of Sales Konrad Thannbichler says: "We must not lose sight of the issue of carbon capture as we continue to drive forward the energy transition. It's all technically possible. And just as for the cost-effective transport, safe storage and carbon-neutral application of hydrogen and ammonia as green gases, a wide range of products is also available to our customers in the field of carbon capture and transport."

* The National Hydrogen Council acts as an independent, non-partisan advisory body. 25 senior experts assist and advise the State Secretary's Committee for Hydrogen on the further development and implementation of the National Hydrogen Strategy.

Salzgitter AG makes steelmaking green

With its SALCOS® climate project, Salzgitter AG has laid the foundations for the virtually zero-carbon steel production of the future. Green hydrogen will replace the coal currently used in the conventional blast furnace process.

Salzgitter AG has erected seven wind turbines on the Group's site in Salzgitter for the production of green hydrogen by PEM electrolysis. These are joined by a highly efficient high-temperature electrolyzer that recovers the waste heat from the steam from steel production. Together, the two facilities can already meet the hydrogen requirements for annealing processes and steel refining, replacing gray hydrogen produced with natural gas.

However, further large quantities of green hydrogen will be needed. The new technology strategy involves gradually replacing the existing blast furnaces with direct reduction plants. In this process, iron ore is reduced with the aid of hydrogen into sponge iron (almost pure iron). Instead of carbon dioxide, this produces water (H_2O), which in turn is reused in the integrated process. Finally, to produce steel, the porous sponge iron is finally melted down with steel scrap in an electric arc furnace.

Salzgitter AG's first direct reduction plant could go into operation in 2026. Overall carbon emissions in steel production can be reduced by more than 95% with the new technological approach.

Subsidiaries of Salzgitter AG are now already producing steel in a carbon-reduced process. Since November 2021, the Miele domestic appliance group has been processing just under 24 tons of carbon-reduced steel per month as part of a pilot project in the cooker and oven sector. Since 2021, Salzgitter AG Group subsidiary Salzgitter Flachstahl GmbH has been supplying green flat steel products with a more than 66%-reduced carbon footprint to four German Mercedes-Benz AG plants. And from 2026, carbon-reduced steel is to be supplied to all BMW Group plants in Europe and the Volkswagen plant in Wolfsburg.

"Getting our customers fit for the future with hydrogen."

Mannesmann Line Pipe has responded to the demands of the envisioned energy transition with H2ready® products. With Manuel Simm and Dr. Holger Brauer in Siegen, we discussed customers' current expectations and why the company is already involved in ammonia applications.

A carbon-neutral hydrogen economy appears to be well within our grasp. What conclusions does Mannesmann Line Pipe draw from this for itself and its customers?
Dr. Holger Brauer: In our departments and in collaboration with Salzgitter Mannesmann Forschung, we have been involved in hydrogen-related product development for ten years now. In addition, in close cooperation with customers, we have constantly monitored changes in requirements, implemented them and made sensible modifications to them. This has resulted in the ongoing refinement of our Mannesmann H2ready® pipes, which reflect the current state of the art and in many cases even exceed current requirements.

Are there already specific customer inquiries and H_2 projects?
Manuel Simm: We now have around 20 contracts of all dimensions and grades on the books. Most of them are from Germany, but we have also served customers in Austria and the Netherlands. These are largely isolated projects, but we believe the current trend is toward general H_2 compliance.

What is the motivation of Mannesmann Line Pipe's customers and what can they expect?
Simm: Customers are experiencing a lively market in the hydrogen sector, and the political framework has been staked out. Implementation is already in full swing. In the meantime, there are numerous strategies and technologies in connection with hydrogen and green hydrogen. However, aside from all the optimism, there is also a degree of uncertainty as to where things are headed in the medium and long term.
Brauer: Thanks to our networking in numerous research projects, working groups and technical committees, we pool our expertise and make it available to our customers. Armed with our experience and expertise, with products that in some cases exceed the required specifications, we want to get our customers fit for the future with hydrogen.

Mr. Simm, you were at the Int'l Hydrogen & Fuel Cell Expo in Japan in 2020. What were your impressions?
Simm: Our talks with exhibitors and visitors showed us that markets differ throughout the world and that we can't generalize. Japan's focus on the energy transition with hydrogen differs from that of Australia or Chile, for example. In this respect, being able to look beyond our own backyard has sharpened our awareness and we can target the right measures in the right places. Incidentally, this also helps us with global tenders received from such countries as Canada, the USA, Slovenia and China, for example.

"Lip service alone, especially from policymakers, is not enough. Openness to technology must not only exist on paper."

Manuel Simm

"For the future, I see a carbon-neutral production and supply chain: from steel production to pipe welding to delivery."

Dr. Holger Brauer

It has long been said that we need green hydrogen for the energy transition – why is this now being joined by green ammonia?
Brauer: Hydrogen as a main energy source is indispensable for a largely carbon-free economy. The advantage of using ammonia, i.e. NH_3, is its storage and transport. In gas form, it is significantly easier to store and its energy content is about twice that of pure hydrogen gas. It liquefies already at -33°C and the pressure for transport in its liquefied state is only about 9 bar.

Does Mannesmann Line Pipe already have marketable products in the ammonia sector as well?
Brauer: Together with Salzgitter Mannesmann Forschung, we have already conducted a study on the existing requirements from the regulations and technical literature. As a result, the tested pipes are already compatible with NH_3 today, i.e. suitable for ammonia applications.
Simm: Incidentally, we have already supplied pipes for the transport of ammonia, including to Armenia in 2008. But now it's a question of sounding out new requirements and developing these into marketable products in collaboration with users and customers.

So the green gases will arrive in the medium term. Where do you see immediate opportunities for carbon savings?
Simm: We benefit here from our feedstock suppliers. They have already produced the first "green slabs" which we have processed into coils and welded into tubes. The results are very promising and economies of scale can certainly be expected in terms of pricing.

Brauer: However, we don't want to rely solely on "green steel". Wherever possible and appropriate, we're already trying to persuade our customers to use higher-strength grades beyond X52/L360. The resultant lower wall thicknesses conserve resources and reduce energy consumption in production, further processing and transport. Our higher-strength grades also permit higher operating pressures in pipelines, which in turn makes throughput more efficient.

Mr. Simm, you're one of the younger people in the industry. How do you personally see the energy transition and the future with hydrogen?
Simm: Hydrogen is the medium that can and will help to massively reduce greenhouse gas emissions. However, lip service alone, especially from policymakers, is not enough. Openness to technology must not only exist on paper. In Germany, we are currently phasing out nuclear energy. We want to phase out coal-fired power generation by 2030 and be climate-neutral by 2045. The timescales are no longer long at all. As employees at Mannesmann Line Pipe, we can certainly be proud of contributing to the success of the energy transition.

Dr. Brauer, when you look ahead to the future of green gases, what do you see?
Brauer: The HFI process in pipe production is based on the use of electricity, which will be generated in the longer-term with renewables. The decarbonization of steel production is also progressing. For the future, I see a carbon-neutral production and supply chain: from steel production to pipe welding to delivery. Green hydrogen and green ammonia will certainly be at the forefront of this.

Manuel Simm,
Regional Sales Manager

After further training to become a transport specialist, Simm arrived at Mannesmann Line Pipe GmbH in 2009 as a trained freight forwarder. Alongside his work in freight purchasing, he completed a bachelor's degree and obtained an MBA. This was followed by a move to sales in 2017. Since then, he has been responsible, among other things, for the global marketing of Mannesmann H2ready® pipes.

Dr. Holger Brauer,
Innovation, Research & Development

Dr. Holger Brauer completed a degree in mechanical engineering followed by a PhD in engineering science. He then started working at Salzgitter Mannesmann Forschung at the Duisburg location in 2002 in the Mechanical Testing and Component Safety Department. In 2007 he moved to Mannesmann Line Pipe, where he works in the Innovation, Research & Development department.

Natural gas pipeline for Volkswagen with an inbuilt future

In Wolfsburg, two state-of-the-art gas-fired power plants will secure the future energy supply for the Volkswagen plant and the City of Wolfsburg. To ensure they can also be operated with hydrogen in the longer term, Mannesmann H2ready® pipes have been used in the construction of the supply line.

Title Story
Green Gases

The highly advanced combined-cycle gas turbine power plants will replace the previously coal-fired north/south power plant units and the west power plant. To switch the energy supply of the VW plant and the City of Wolfsburg to natural gas, a 33 km high-pressure gas pipeline has been laid from the Walle connection station north of Braunschweig to the VW plant site in Wolfsburg. The client is Gasunie, the Dutch gas network operator. Gasunie has a roughly 16,000-kilometer natural gas transmission network in the Netherlands and northern Germany. In Germany alone, it has some 4,300 kilometers of high-pressure pipelines. Around EUR 80 million is being invested in the new pipeline, says Gasunie.

HFI-welded steel pipes in the new gray-and-red design

In a forward-looking approach, the pipeline has been designed and built for the operation and transport of hydrogen. Helping to make this possible are the new Mannesmann H2ready® pipes. What is new here

Left: Volkswagen plant site in Wolfsburg.
Above: Preparations for laying the new high-pressure gas pipeline from Walle to Wolfsburg.

"For us, and certainly also for the network operator Gasunie and the VW Group, this is a milestone on the road to the future."

Manuel Simm, Regional Sales Manager Mannesmann Line Pipe

is not only their technical configuration, which in some cases even exceeds the requirements of the EIGA guideline for the transport of hydrogen, but also their appearance. As there is no binding color coding yet for hydrogen, it was agreed with Gasunie to coat the pipes with PE in light gray with red stripes. Manuel Simm, who oversaw the project on behalf of Mannesmann Line Pipe, was also responsible for consultations on the technical specifications and production of the HFI-welded steel pipes: "In total, we're talking about almost 1,900 pipes with single lengths of up to 18 meters." The grade has the designation L360NE, and the pipe diameter is 400 mm. "To withstand the planned operating pressure of 84 bar, the pipes mainly have a wall thickness of 10 mm," Simm continues. "To ensure that at first natural gas and later hydrogen can flow efficiently through the pipeline, the pipes are lined with epoxy resin flowcoat."

Minimal impact on the natural environment

The planners paid particular attention not only to the specification of the new supply line, but also to minimizing the impact on the environment during installation. The route thus runs parallel to an existing pipeline and underwent trenchless laying over a length of 9 km with minimal impact on the natural environment. "For this purpose, the pipes were given a reinforced PE coating and an additional one of glass-reinforced plastic to optimally protect the pipe string from mechanical damage in the ground," Simm explains. A total of 14 HDD (Horizontal Directional

Video on the Internet

A video on the trenchless laying of Mannesmann H2ready® pipes by HDD is available at **magazine.mannesmann-linepipe.com/w-w**

Top left: The pipes are produced at the Mannesmann mill in Siegen and coated in their gray-and-red design

Bottom left and above: At a total of 14 points, the up to 1.9 km long pipe strings were trenchlessly laid by HDD with minimal impact on the natural environment.

Drilling) boreholes were drilled under rivers, canals, roads and railroad tracks. Such a special technical and logistical challenge arose towards the end of the demanding pipeline project in November 2021, when the pipeline had to underpass the 'Südliche Düpenwiesen' nature reserve to the west of the VW plant site and the A39 freeway. After around nine and a half hours of work, the 1.9 km long pipe string arrived at its destination well ahead of schedule. On February 9, 2022, Gasunie then announced the completion of the new Walle-Wolfsburg high-pressure gas pipeline.

Laying the foundations for secure supplies

With the completion of the pipeline and the construction or extension of a total of six gate valve stations along the route, the foundations have been laid for the connection and operation of the new combined-cycle gas turbine power plants in Wolfsburg. The changeover from coal to natural gas is to be accomplished by November 2022 so that a secure energy supply can continue to be safeguarded to the VW plant in Wolfsburg. Beyond the plant boundaries, the VW Kraftwerk GmbH power generating company also supplies the municipality of Wolfsburg with electricity and district heat.

Massive carbon savings

For VW, the power plant changeover is key to its 'goTOzero' strategy to improve its environmental footprint. According to Volkswagen Kraftwerk GmbH, running the new power plants at the Wolfsburg production site on natural gas will from now on save around 1.5 million metric tons of carbon compared with current emissions. A cut of around 60% or, to put it in automotive terms, a reduction equivalent to the average annual carbon emissions of 870,000 autos.

Showcase project of a special kind

"For us, and certainly also for the network operator Gasunie and the VW Group, this is a milestone on the road to the future," says Simm. "We have every reason to be proud of being able to help to decarbonize vehicle production in Germany with our German-made premium pipes," says the 35-year-old Regional Sales Manager. That green hydrogen will then be able to flow through the pipe in the near future puts the icing on the cake, in his view. "An absolute showcase project: a high-pressure natural gas pipeline with an inbuilt future."

The pipeline route runs from the Walle station to the VW plant in Wolfsburg 33 km away.

The Wolfsburg Volkswagen site – the world's biggest production plant

The Volkswagen plant in Wolfsburg is the parent plant of Volkswagen AG. In the late 1930s, it was built at the same time as a totally new city. The 'City of the "Strength through Joy" Car (or Beetle) near Fallersleben' was then renamed Wolfsburg in 1945. Occupying a total area of 6.5 million m², the plant is the world's largest factory. At the end of 2018, around 63,300 people were employed at the Wolfsburg site, producing over 700,000 vehicles per year.

The last of the over 11.9 million VW Beetles built at the parent plant rolled off the Wolfsburg assembly line on July 1, 1974. The Golf then successfully replaced it and is still produced in Wolfsburg today in numerous variants, also now including the e-Golf.

Around 70% of the finished cars are transported by rail via the connecting line to Fallersleben station. The VW plant's rail network comprises 60 km of track and 157 switches and ranks as Europe's biggest private loading station.

Volkswagen 'New Auto'

With its group strategy 'New Auto – Mobility for Generations to Come,' Volkswagen AG, which comprises such brands as Audi, Porsche, Seat and Škoda, is responding to the massive shift in the world of mobility and to climate change.

Its guiding principle is the development of sustainable, connected, safe and tailored mobility solutions for future generations. VW wants to realign itself from vehicle manufacturer to a leading, global software-driven mobility provider. A company that is redefining mobility while also doing business climate-neutrally and conscientiously.

'GoTOzero' strategy

VW intends to become a carbon-neutral company by 2050. By 2025, production-related environmental externalities (carbon, energy, water, waste, volatile organic compounds) are to be reduced by 45% per vehicle relative to 2010. By this time, the share of battery-electric vehicles in its model portfolio is to rise to between 20 and 25%. By 2030, the e-share of its new car fleet in Europe and China is to grow to at least 40%.

"The car and individual mobility have a bright future. With its innovative brands and state-of-the-art technology platforms, Volkswagen is preparing to play a leading role in the new mobility world."

Herbert Dies, CEO
Volkswagen AG

Image: © Alamy

North Sea to Become Europe's Green Power Plant

Not least due to pressure from the European Union, the expansion of offshore wind farms in the North Sea continues to make headway. In the wake of supplies to the Beatrice Offshore Wind Farm, Mannesmann Line Pipe is also making its mark on the Dogger Bank, where the world's largest offshore wind farm is currently being built.

With its strategy for the future expansion of offshore renewable energies, the EU Commission's targets speak a clear language: by 2030, existing capacities are to increase fivefold from 12 to 60 GW. Under the strategy, a climate-neutral EU will require as much as 340 GW of installed capacity by 2050. For these projects, the North Sea will become Europe's green power plant.

But it is important not only to expand power generation, for distribution plays a role that is at least as important. It is therefore essential that the expansion of the power grids keeps pace with the expansion of renewables.

The German transmission system operator TenneT has an offshore transmission capacity of around 7,000 MW in the German North Sea and is already working on completely new electricity distribution systems. For example, in cooperation with consortium partners, the company plans to build a so-called wind energy distribution hub in the North Sea by 2035, which, at 12,000 MW, will have the capacity of twelve large power plants.

The distribution hub will supply Denmark, the Netherlands and Germany with green wind power from the North Sea. The ingenious feature is that it connects several offshore wind farms with the countries and at the same time establishes a direct link between the countries themselves. When the wind blows, electricity from offshore wind farms is transmitted to the countries, and when the wind is calm, the same lines can be used for direct electricity trading among them.

Incorporating green hydrogen

In the future, however, it will probably not be possible to use the energy from offshore wind farms via the power grid alone. There is therefore demand for power-to-X schemes and for the integration of electrolyzers for the production and storage of green hydrogen. TenneT is convinced of the need for a systematic expansion of the gas and electricity infrastructure. Only if the production and storage of green hydrogen are properly integrated in the overall power system can they meaningfully supplement the power grid and relieve the burden on it. And only then can wind power effectively contribute

The potential area of the Dogger Bank Offshore Wind Farm is 8,860 km². 5 GW of wind power capacity is to be gradually installed by the end of 2026.

The first of the total of 227 transition pieces have already been shipped by the manufacturer.
Image: © Press release, doggerbank.com

to the desired energy transition and climate neutrality.

Dogger Bank, the world's biggest offshore wind farm

But back to the North Sea. The Dogger Bank is a large sandbank running east-west in the North Sea, extending from Britain via the Netherlands and Germany to Denmark. The world's largest offshore wind farm is currently being built in the British section. The potential area covers 8,660 km² and is located 125 to 290 km off Yorkshire in Northern England.

The project is being developed by a joint venture and is divided into three areas: Dogger Bank A, B and C. These will each have 1,200 MW of installed capacity and are scheduled to gradually come on stream by the beginning of 2026.

In addition, there is the Sofia section with a further 1,400 megawatts, for which commissioning is scheduled for the end of 2026. Together, the first construction stage of the wind farm thus amounts to 5 GW, which is roughly equivalent to the output of three to four medium-sized nuclear power plants. By fully exploiting the potential area, an installed capacity of up to 13,000 MW would be feasible in the longer term.

Production of the turbines and monopile foundations

General Electric will supply a total of 277 offshore wind turbines to Dogger Bank A to C. Area C will be equipped for the first time with 87 Haliade-X 14 MW latest-generation offshore wind turbines.

The contracts for the production of the required monopile foundations and transition pieces have been awarded to a Dutch-Belgian consortium. The companies will construct all 277 monopiles and transition pieces for Dogger Bank A, B and C. One company will be responsible for the production of the monopiles and another, for its part, for the design, construction and coating of the transition pieces.

Matching tube lengths and "Beatrice expertise"

Through Salzgitter Handel in Poland, Mannesmann Line Pipe already had excellent links with the manufacturer of

Mannesmann Line Pipe has supplied tubes for the boat landings at the Dogger Bank Offshore Wind Farm. These ensure the trouble-free and safe docking of maintenance vessels.

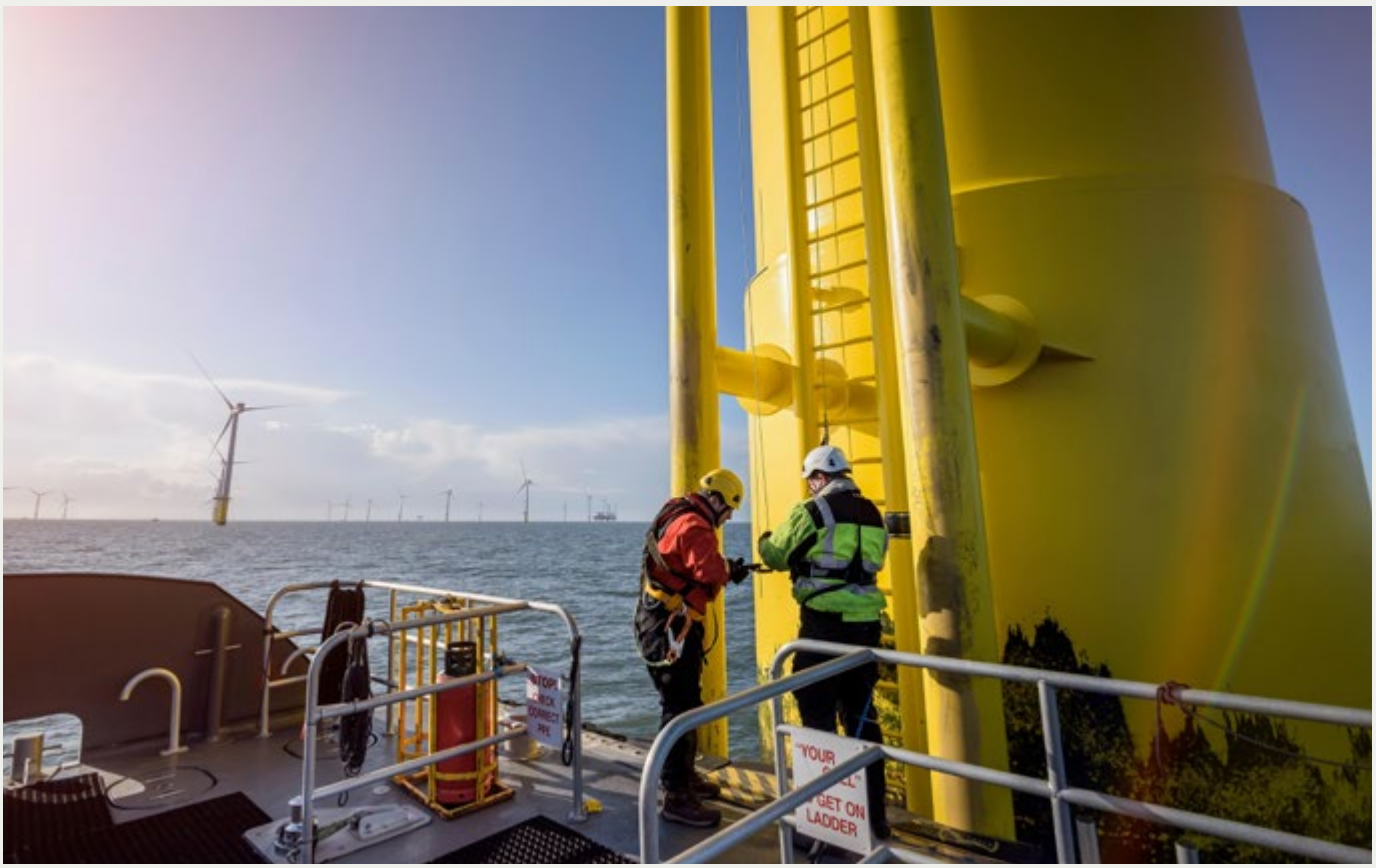


Image: © Alamy

In Dogger Bank C, 14 MW turbines of the latest generation from GE will be used for the first time.

Image: © GE Renewable Energy

"The energy transition and steel are an excellent match more than ever before."

Guido Ludwig, Regional Sales Manager Mannesmann Line Pipe

the transition pieces. The company has branches in Belgium, the Netherlands, the United Kingdom and Poland and has more than 50 years of experience of the engineering, construction, supply and erection of steel structures. Back in 2016, tubes from Mannesmann Line Pipe were processed here for the Beatrice Offshore Wind Farm in the north-east of Scotland.

For Dogger Bank A, the company has already fabricated the first 95 transition pieces for the installation of the monopiles in water ranging in depth from 18 to 63 m - the first have already been supplied. For the 27 m long transition pieces with a diameter of around 8 m, the boat landing design called for tube lengths of 13 and 13.30 m, each of which Mannesmann Line Pipe was able to supply in a single piece. "This eliminated hundreds of additional time-consuming and costly circular welds in the construction of the transition pieces. In addition, the surface of our Mannesmann tubes has little scaling, which in turn makes it easier to coat the tubes," says Guido Ludwig, the responsible Regional Sales Manager at Mannesmann Line Pipe, summing up the arguments decisive for the award of the contract. "In the meantime, we have supplied around 1,100 metric tons of HFI-welded steel tubes measuring 355.6 x 25 mm of grade S355J2H conforming to DIN EN 10210 via Salzgitter Handel in Poland," Ludwig adds.

Installation from mid-2022

Contracted to install the monopile foundations and transition pieces is the Belgian company Jan de Nul. The "Voltaire", only recently built to the highest environmental standards, will be used for the work. The vessel can run on second-generation biodiesel, which reduces the fuel's carbon footprint by up to 90%. The vessel also comes with a dual exhaust filter system that removes up to 99% of nanoparticles from exhaust gases and significantly reduces emissions of NOx and other pollutants with the aid of a catalytic converter. The main crane can lift loads of over 3,000 tons, enabling it to erect the current and future generations of offshore wind farms with heights of over 270 m and rotor blades up to 120 m long.

Another step toward the North Sea's green power plant

The commissioning of the Dogger Bank Offshore Wind Farm marks another step on the North Sea's path to becoming Europe's green power plant. However, to achieve the goals of the Paris Climate Agreement by 2030, many more will have to be added. Says Ludwig: "With our HFI-welded steel tubes we can help achieve these ambitious targets. The energy transition and steel are an excellent match more than ever before."

The brand-new "Voltaire" from the Belgian company Jan de Nul will be used for the installation of the monopiles, transition pieces and wind turbines. Image: © Jan de Nul

Image: © IFK, Oliver Heinl

A Shared Sustainable, Secure and Commended Supply

The region between the Main River and Rhön hills is one of the driest in Bavaria. So as to safeguard the drinking water supply for decades to come, a new shared water pipeline has been built using HFI-welded steel pipes from Mannesmann Line Pipe. There was even a very special commendation for this.

The dry periods on Franconia's arid plain have become increasingly frequent in recent years, and climate change is expected to cause further extremes. This presents the municipal utilities with the challenge of safeguarding the supply of drinking water for a population of 220,000, agriculture, industry and commerce in the long term.

As a regionally involved project participant, Stadtwerke Schweinfurt utility company decided to secure supplies by adopting a cross-sectoral approach and aiming for climate neutrality. With their own ground-mounted photovoltaic system, they want to convert the entire energy supply for the water sector to green electricity in the medium term. Artificial intelligence is also being used to control the complex, cross-sector system and improve forecasts for consumption and generation.

26 km long shared water pipeline

So that sufficient drinking water capacity is available throughout the region, planning for an inter-municipal water supply system for Lower Franconia got underway in 2018.

In addition to Stadtwerke Schweinfurt, the parties involved in the implementation of the project were the special-purpose water supply association of the Rhön-Maintal Group, Stadtwerke Hassfurt utility company and the special-purpose water supply association of the Knetzgau-Sand-Wonfurt Group. A sustainable supply is assured by the ample water production capacities of Stadtwerke Schweinfurt, which will make 'exports' of over 1 million m^3 of drinking water per year possible, even in the long term. The water is extracted from a total of 48 wells and distributed throughout the region via a 26 km long pipeline.

Persuasive consultancy services

Stephan Maier and Kerstin Becker were the project managers from Mannesmann Line Pipe in charge of the engineering project. Maier recalls: "At the bidding stage, we were fortunate to have the chance to present

our expertise from numerous drinking water projects to the responsible parties on the client's side and to share our positive experience in terms of duration, workload and costs of pipe-laying using the plowing method."

Also crucial for the award of the contract in addition to their technical expertise, however, were compliance with delivery deadlines, intelligent logistics services and the procurement of the required pipe elbows.

From May 2020, Mannesmann Line Pipe then supplied some 1,650 HFI-welded steel pipes in four different diameters from DN 200 to DN 400 in individual pipe lengths of up to 16 m. These were lined with Portland cement and externally coated with a 5 mm thick layer of PE. "We organized the deliveries as required to the storage locations we had previously assessed and found to be suitable," Maier explains.

Much of the pipeline was laid by IFK using the trenchless plowing method. Image: © IFK, Oliver Heinl

"Winning the Stadtwerke Award 2021 for our climate-friendly water supply strategy is a great vindication of our efforts in pushing ahead and effectively mastering the energy transition in our region."

Thomas Kästner, Managing Director of Stadtwerke Schweinfurt GmbH

Eco-friendly trenchless installation

To minimize the impact on the delicate ecosystems near the Main River, the pipeline was laid in the fall and winter of 2020/2021. Much of the route was laid using the plowing method recommended by Mannesmann Line Pipe. The Salzburg-based IFK company laid the pipe string 1.5 m deep in the ground and covered it directly with the loosened soil in the same operation.

Commended project

Maier also continued to provide advice on site during pipe-laying. "Although we had to deal with contacts from four municipal utilities, four pipe-laying companies and a civil engineering firm, we literally pulled together from the outset and managed the project from design through to completion on time and on budget."

The outcome was appreciated not only on site. The jury for the Stadtwerke Award 2021 was also impressed by the new inter-municipal water supply system as part of the submission entitled 'Climate-neutral water supply in Mainfranken' and awarded them first place.

The prize-giving ceremony took place on September 7 and 8, 2021. Congratulations also from Mannesmann Line Pipe!

Image: © IFK, Oliver Heinl

Pipe-laying with the plowing method

Using the plowing method, pipes with a diameter of DN 40 to DN 600 can be laid to a depth of 2.5 m in soil classes 2 to 5.

The advantages at a glance

- 20 times faster than a digger
- Up to 40% cheaper than conventional laying methods
- Protects the environment
- Reduces trenches, excavated soil, soil transport and land damage
- Minimal nuisance to neighbors

Video on the Internet

You can find a video of the trenchless laying of the water pipeline here:
magazine.mannesmann-linepipe.com/vsw

Image: © Transportation Ministry Baden-Württemberg/Christian Blesinger

eWayBW – 18-Kilometer Research Lab on the B 462 Highway

Some 6% of overall carbon emissions in Germany are caused by road freight transport. Climate-friendly alternative drives are therefore in demand and are currently being tested in the eWayBW pilot project. HFI-welded pipes from Mannesmann Line Pipe are playing a strong supporting role in this.

The focus of the eWayBW pilot project is the near-authentic electric operation of hybrid trolley trucks (HT trucks), modeled on electrified rail lines. During the three-year pilot, however, alternative drive technologies will be deployed alongside the HT trucks: a hydrogen/fuel cell truck, a bio-methane truck, a purely battery-electric truck with a pantograph, i.e. with power pick-ups on the overhead line, and two other purely battery-electric trucks. One of the HT trucks is also temporarily using synthetic fuels, so-called reFuels, for hybrid operation. This means that all currently promising drive technologies for climate-friendlier road haulage are being tested.

Scientific evaluation

Accompanying scientific research will primarily examine energy supply and consumption as well as the impact of the drives in terms of noise emissions, air pollution and road design. The 18 km test section on the B 462 highway in the Murg Valley in Baden-Württemberg provides the ideal conditions for this. Two freight forwarders ship around 500,000 metric tons of paper per year in 24/7 operation from paper mills in Gernsbach-Obertsrot to a logistics center in Kuppenheim. With up to 64 return trips per day, the HT trucks cover a total of over 100,000 km on the test section every year.

No end-to-end electrification required

However, of the 18 km, only two sections with a total length of just under 4 km are electrified with overhead wires. End-to-end electrification is not necessary because the trucks employed all have a battery that is additionally charged during contact with the overhead lines. Regular operation on the test section started on September 21, 2021.

How the system works

Sensors in the roof of the truck detect whether there is an overhead wire above the vehicle. The built-in pantographs are extended and supply the electric motor with power. As soon as the overhead

The pilot section of the B 462 has a total length of around 18 kilometers. For the two electrified sections measuring just under 4 kilometers, Mannesmann Line Pipe supplied pipes in diameters of 508 and 610 mm with wall thicknesses of 8 to 20 mm.

Image: © Transportation Ministry Baden-Württemberg/ Christian Blesinger

wire ends or the truck starts an overtaking maneuver, the hybrid drive kicks in. The advantage of a battery-based hybrid drive is that the battery is charged while power is supplied by the contact wire, so that the maximum range is available in battery mode when the vehicle leaves the overhead wire section.

Modeled on the railroads

The overhead lines of the eWayBW system are based on the contact wire technology used on railroads, although they are operated with a low voltage of 670 V compared to the usual 15,000. They are suspended from masts with crossbeams spaced about 50 m apart. The contact wires attached to the booms are held at a height of 5.12 m and can be lowered to as low as 4.70 m if required.

High material requirements, delivery at short notice

Because of delivery problems associated with the originally envisaged tube manufacturer, Siemens Mobility sent an inquiry to Mannesmann Line Pipe via its partner Metalogalva in Portugal. As the masts take the entire bearing loads of the crossbeams and power supply lines, the material had to be suitably dimensioned. HFI-welded steel tubes in diameters of 508 and 610 mm with wall thicknesses of 8 to 20 mm in grade S355J2H to EN 10219-1 or EN 10210-1 were used. It was also possible to reduce the requested delivery time from 13 to only 5 weeks. This was facilitated by the flexible rescheduling of existing orders, as well as the use of input material that was actually intended for the production of new stock.

Road freight transport of the future

The system will be piloted until mid-2024, with the trucks being pooled and made flexibly available to the participating companies. This means that each company can test the various vehicles and also gain its own experience concurrently with scientific evaluation. The various drive options will turn the eWayBW project into an 18 km research lab for the climate-friendly road freight transport of the future.

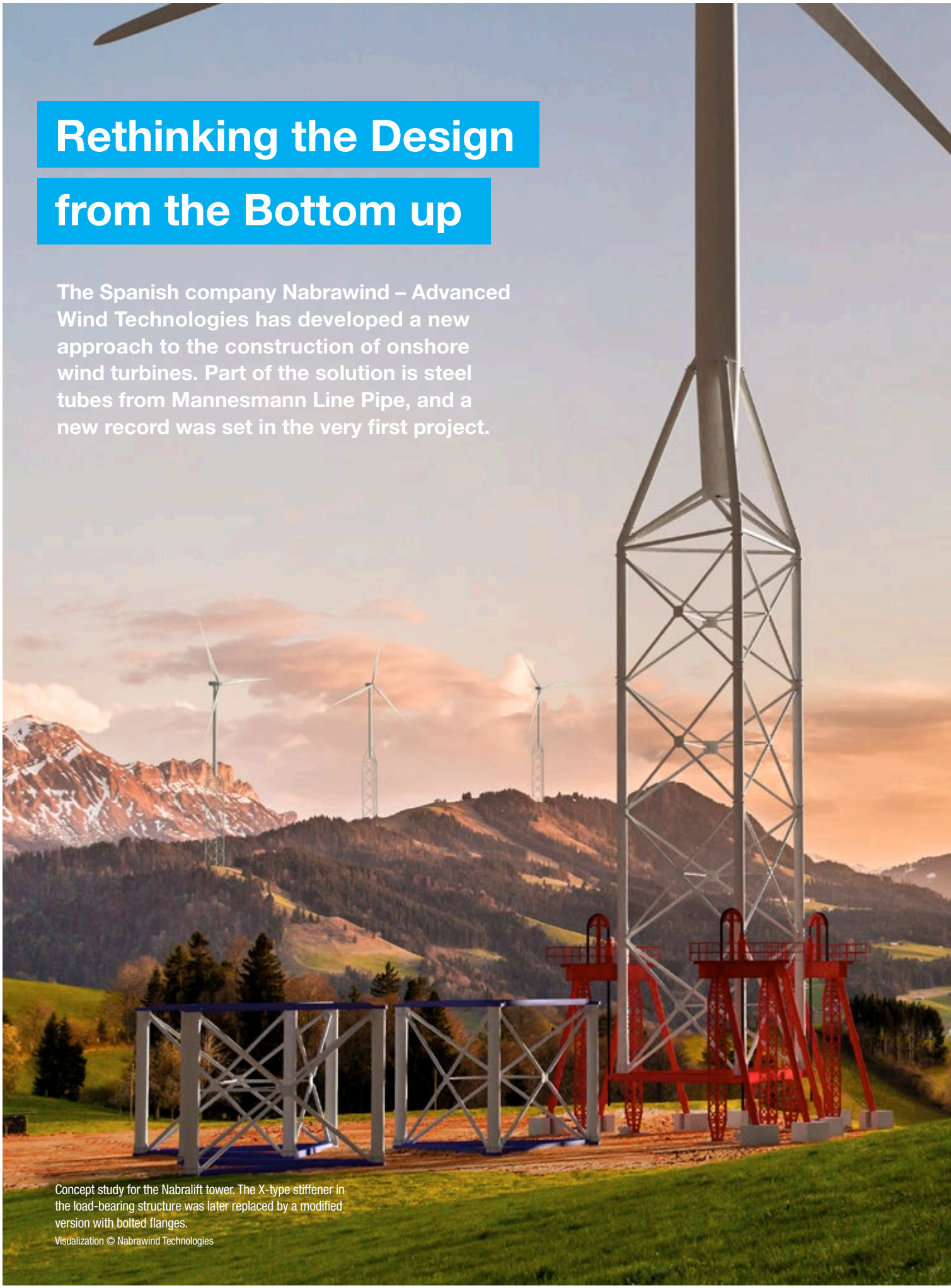
The design and protection strategy for electrification are based on the proven overhead wire technology of Deutsche Bahn, the German railroad company. Due to the low voltage, there are no adverse effects on drivers in terms of electromagnetic compatibility.

Image: © Ministerium für Verkehr Baden-Württemberg/Christian Blesinger

Image: © Transportation Ministry Baden-Württemberg/Christian Blesinger

Rethinking the Design from the Bottom up

The Spanish company Nabrawind – Advanced Wind Technologies has developed a new approach to the construction of onshore wind turbines. Part of the solution is steel tubes from Mannesmann Line Pipe, and a new record was set in the very first project.



Concept study for the Nabralift tower. The X-type stiffener in the load-bearing structure was later replaced by a modified version with bolted flanges.
Visualization © Nabrawind Technologies

Nabrawind's engineers set themselves the overriding goal of significantly reducing the cost of manufacture, transport and assembly of onshore wind turbines. The fact that the carbon footprint can also be reduced at the same time is a positive side effect that also makes the new process more eco-friendly.

Questioning standard practice

The conventional approach to the installation of wind turbines is to first erect the complete turbine tower and then to erect the rotor and turbine using one or even several cranes specifically designed for extreme heights and high tonnages. This is a technically elaborate and highly ambitious undertaking, which more often than not is interrupted by the prevailing winds and, given an installation height of usually well over 100 m, is obviously not without its dangers.

"There's got to be another way to do this," the engineers at Nabrawind thought to themselves and called the existing approach completely into question, or rather, turned it on its head. Because the construction of a wind turbine with the Nabralift system also starts at the bottom, but with the top of the tower and the rotor first.

New design, new system

The Nabralift tower represents a completely new technological approach in terms of both design and erection. The design consists of a triple-column structure installed under the drive unit. This eliminates most of the tower required for conventional installations and offers a number of benefits. This is because the tower is the largest and heaviest part of a wind turbine. Weighing several hundred tons, it contributes about 15 to 25% of the cost of a wind turbine and also accounts for a large proportion of the assembly and transport costs.

But the real innovation of Nabrawind's engineers is its self-erection system (SES), which allows the installation of a complete wind turbine without the deployment of cost-intensive specialized crane equipment. And it does so even at Beaufort wind forces 6 to 7, which with conventional construction methods cause costly downtime and erection stoppages.

Benefits for foundation work, logistics and site setup

Depending on the height of the tower, the three-legged tower design involves far less material and weight than conventional construction methods and can therefore also be installed on a new foundation design. This reduces costs and accelerates execution. There is enormous potential for savings in concrete alone, depending on the height of the tower and the soil conditions.

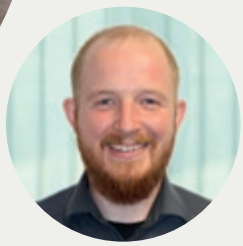
The use of much smaller components that can be pre-produced in series simplifies the entire supply and logistics chain and significantly reduces the number of oversized loads

Erection with the Nabralift system: First, the top of the tower is connected to the triple-member tower transition unit.

Once the nacelle, tower slewing ring and rotor is connected to the tower ...

... the SES (self-erection system) lifts the structure weighing hundreds of tons into the air until the target height is reached.

Its hub height of 144 m makes the Nabralift tower at the Oualidia Wind Farm in Morocco Africa's tallest wind turbine.



"As a technician, of course, you're always thrilled when innovations make it to market. And all the more gratifying when our HFI-welded tubes have a hand in it."

Kevin Kroh, Product Manager Mannesmann Line Pipe

that have to be transported. Stockyard requirements are also not as complex, and site setup and management also benefit from the new process.

Erection from the bottom up

The erection of a Nabralift tower starts with the top of the tower tube, which is connected to the tower transition unit. Then the nacelle and the tower slewing ring with the rotor blades are fitted to the tower.

The SES then comes into play, lifting the entire upper turbine unit 17 m into the air. Then the tower columns, each 16 meters tall, are positioned beneath and connected to the upper turbine unit. The supporting three-legged design structure is then stiffened with X-type bracing.

In a second lift, another 16 m of height is gained, and the same cycle of lifting, connecting and bracing continues until the desired final height is reached. Within three days, a tower is thus erected to a height of 140 m without the need for a large, heavy-duty crane.

Sought and found

In August 2018, Nabrawind erected the first Nabralift tower in Eslava, Spain, near Pamplona, initially just to test the design and try out the SES.

The findings resulted in the optimization of the tower design with regard to the X-type bracing for the first wind turbine specifically designed for the Oualidia Wind Farm in Morocco. In contrast to the original tube geometry, which envisaged tapered ends of the bracing tubes, flanges with matching bolt hole rims were now to be used for precision bolting.

Kevin Kroh, who oversaw the project from the outset as product manager for Mannesman Line Pipe, recalls: "The challenge was to precisely match the manufacturing tolerances in terms of pipe ovality and diameter to the tolerances of the flanges so that they would fit perfectly when subsequently welded on." Working together with the creative team at Nabrawind, they therefore discussed the technical possibilities and the advantages of the HFI welding process in this context. "The novel design

Above: The HFI-welded tubes manufactured in Hamm and Siegen were further processed in Spain before being shipped to Morocco.
Left: Pre-assembly of the bracing tubes to form the X stiffening the wind turbine tower.

The SES in action. The second tower unit with the steel tubes supplied by Mannesmann Line Pipe is assembled and connected to the unit above.

and the new construction method were of course motivation enough for us to want to make and deliver the required quality," says Kroh. "Especially in view of the fact that this was also the first time we have been asked to supply an onshore wind turbine."

The dimensions calculated for the tubes for the X-type tower bracing resulted in a diameter of 406.4 mm with wall thicknesses of 12 mm. They were manufactured in lengths of 10.46 m. However, short tubes were also needed as transition pieces between the bracing and the corners of the tower structure. This application required a wall thickness of 25.4 mm for the same diameter. In mid-2021, the tubes left Hamm and Siegen by truck for Spain, where they were further processed, blasted and painted for assembly.

Nabralift tower premiere in Morocco

At Oualidia Wind Farm operated by the French project developer InnoVent in Morocco, Nabrawind has now realized its first commercial wind turbine with the Nabralift system. The installation of the 3.6 MW wind turbine was accomplished with self-erection of the complete turbine. "During the process, Nabrawind's self-erecting system lifted the 700-tonne turbine in strong wind conditions, with gusts of up to 15m/s, proving the ability of this new patented process to minimize project delays due to strong winds," the Spanish company reported on its website in February 2022.

Africa's tallest wind farm

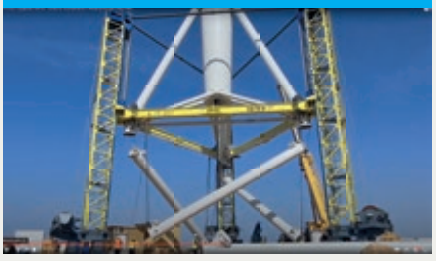
"This milestone completes the installation of the first Nabralift tower in Africa and confirms all this new tower technology's key advantages: significant mass reduction of steel and concrete both in the tower and foundation, craneless self-erection, removal of logistics barriers and minimal environmental footprint," the press release continues.

"As a technician, of course, you're always thrilled when innovations make it to market," says Kroh. "And all the more gratifying when our HFI-welded tubes have a hand in it."

And with a record at the first attempt. Its hub height of 144 meters makes the Nabralift tower Africa's tallest onshore wind turbine.

For Mannesmann Line Pipe, it is also a more than successful debut in a potential new business segment.

Video on the Internet



You can find a video of the erection of the wind turbine in Morocco here:
magazine.mannesmann-linepipe.com/nabra

Image: © Ferngas Netzgesellschaft

Greater Supply Security for Industry, Commerce and Homes

Ferngas Netzgesellschaft mbH's natural gas pipeline 442 between Limbach and Niederhohndorf near Zwickau is being replaced. This means that an approximately 125-kilometer network section from the 1950s and 1960s is being upgraded with HFI-welded pipes from Mannesmann Line Pipe.

The pipeline designated EGL 442 carries natural gas to 26 industrial, commercial and municipal utility customers. It thus provides a secure and reliable supply of energy to numerous commercial enterprises and private households in southeast Thuringia and Saxony.

More efficient, flexible and secure

"By modernizing EGL 442, we are bringing the pipeline into line with the current state of the art," says Ferngas project manager Philipp Egle. "This will also make network operations more flexible and efficient and upgrade the monitoring technology."

To safeguard supply security for the next 50 years, Ferngas Netzgesellschaft has high expectations of the quality of the line pipe material. Operation at up to 84 bar will in future be possible, and the transport of hydrogen is also envisaged.

Five-year installation project

The 125 km network section is a complex system of network nodes, branches, supply stations and consumer connections. Numerous roads, streams and rivers have to be crossed. The installation work has therefore been divided into 20 sections. Work got underway back in 2019 and is scheduled for completion in early 2023.

Meticulous planning and execution

By establishing bypasses, an uninterrupted supply to all customers is initially ensured while installation work proceeds. The plan then envisages the measurement of the existing pipeline and the marking of the protection and work areas. The old pipes are then exposed, lifted out of the pipe trench and cut to appropriate lengths for transportation. The new pipe is then welded into strings and laid in the same place in the pipe trench. This calls for a total of around 10,000 welds, each of which is individually inspected, and then the entire pipeline section is subjected to a stress test.

Elaborate system of production, processing and logistics

Just as complex as the pipeline itself and its installation was Mannesmann Line Pipe's project and logistics management. Pipes of varying dimensions and wall thicknesses with a wide range of coating variants are required.

Image: © Ferngas Netzgesellschaft

Each pipe consignment from over 760 truckloads is closely inspected.

Image: © Ferngas Netzgesellschaft

A total of around 10,000 pipe welds are required for the 125 km network section.

"We are upgrading the energy infrastructure by using the replaced pipeline to improve the security of supply for decades to come – also with a view to transporting hydrogen."

Philipp Egle, project manager
Ferngas Netzgesellschaft

For individual sections, for example, this means the punctual delivery of pipes in diameters DN 100, 150, 400 and 500 and various wall thicknesses from 3.6 to 11 mm in grades L290NE and L360NE. Depending on the application and laying method, PE coatings, PE coatings plus FCM-N (fiber cement mortar) coatings or PE coatings plus GRP (glass-reinforced plastic) coatings are supplied. In total, this involves an elaborate system of production, processing and logistics for approx. 7,000 pipes, spread among around 760 truckloads.

No two sections the same

"For us, 20 installation sections unfortunately doesn't mean the same procedure 20 times," says Egle. "Routine hardly ever cuts in on EGL 442." That's because each section has its own topography and tricky maneuvers. Like, for example, a section some 230 m long that had to be laid in the Zeulenroda reservoir. To obtain the necessary installation and assembly clearance, the level of the reservoir first had to be lowered by 5.85 m. "That was particularly challenging in this area in terms of preparation and planning," says Egle. Because not only did the pipe-laying work have to be meticulously prepared, but the needs of tourism and water management also had to be taken into account.

After all preparations had been made, the new pipe string was welded to the matching pipe bends, tested and coated with fiber cement mortar. The string was then laid with the aid of five diggers, which positioned the new pipeline precisely in the right place. This was followed by the connection to the up- and downstream pipeline sections.

"After just one vegetation period, it looks in most places as if we had never been there at all," says Egle summing up. "And that is actually our aim: to establish security of supply that you don't even see. And that for over 50 years."

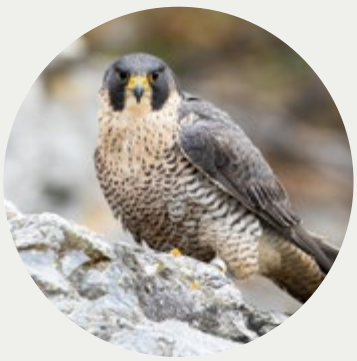
Image: © Ferngas Netzgesellschaft

Image gallery on the Internet

Further images and the pipeline route can be found at:
magazine.mannesmann-linepipe.com/egl442

Win-Win for People and Nature

A disused quarry in the west of France is being converted into a water reservoir with a capacity of 2.5 million cubic meters. The spectacular installation of the supply pipes on a 70 meter high rock face was anything but routine for everyone involved.



The Lac du Jaunay is largely responsible for the supply of drinking water to the western Vendée region of France. However, its capacity proves to be insufficient at various times of year and surplus precipitation flows unused into the sea during the winter.

Climate change and its impact on precipitation in the region prompted the water utility Vendée Eau to look for additional storage capacity in good time. The company found what it was looking for in Les Clouzeaux, which has a disused quarry on its outskirts. Instead of building a dam to create a new lake, the water utility seized this ideal opportunity to use a derelict site.

Doubling storage capacity

The old granite quarry, which operated in Les Clouzeaux until 2018, will be able to store 2.5 million m³ of raw water, thus almost matching the capacity of the Lac du Jaunay. A pipeline about 25 km long will allow the water to be transmitted in both directions.

The installation of the new pipelines called for extensive preparations. But before the work could really get started, nature had already taken the lead. As a nest site, a pair of peregrine falcons had chosen, of all places, a spot on the rock face that had been earmarked for the installation of the water pipes.

After exact positioning, the installed pipe strings were welded together by fitters working at dizzy heights on the 70 m high rock face.

Off to a late start

Without further ado, the installation work was suspended for six months until the offspring had fledged and the nest had been vacated by their parents. But then the work could finally begin. Industrial climbers abseiled down the 70 m high rock face and first fastened special brackets to precisely hold the three parallel pipe strings.

On completion of this preliminary task, a roughly 15-strong team was busy installing the pipes in February 2022. These had been welded into string sections and two heavy-duty cranes precisely positioned them at an angle of 67 degrees ready for installation. It was now the turn of the climbers again, who screwed the pipes with precision into the prepared sleeves. The next pipe strings were then pushed into the sleeves of the lower pipe ends, likewise fastened in the brackets and welded together.

Small quantity, big demands

Although the request from our long-standing business partner SPREAD for water pipes in this region involved only 156 m of DN 300 and 84 m of DN 400, the HFI-welded pipes have to satisfy very demanding requirements in the planned application.

First, they will be exposed to extreme temperatures in summer and, second, they will be in the water at fluctuating levels for prolonged periods. After consultation with the experienced technicians of Mannesmann Line Pipe, they were manufactured in grades P355 and B in lengths of 12 m with wall thicknesses of 5 and 5.6 mm and delivered by Capelle freight forwarders. The pipes were lined with drinking-water-standard Portland cement and given a special 'Interzone 954' outer coating resistant to heat, cold and water.

Second-hand recreation area

Following the spectacular installation and connection of the pipes, flooding of the quarry started at the end of March 2022 and is scheduled to be completed over the winter of 2022 by April 2023.

By then a roughly 10 hectare lake up to 55 m deep will have developed, providing a magnificent backdrop for running, horseback riding and walking. It will also become a new habitat for flora and fauna. 6,000 new trees have already been planted and five observation points have been set up. The Tinouze, a stream passing close to the quarry, has been renatured, and an educational trail for young and old explains the history of the quarry, the natural water cycle, and the topic of biodiversity. A natural stone grandstand with space for up to 500 visitors will also provide a natural setting for events for local residents, clubs and schools

Let's hope the peregrine falcons find a nice place to watch!

Video and image gallery on the Internet

A video and other images on the installation of the pipes can be found at **magazine.mannesmann-linepipe.com/ve**

Anything but routine – the team of climbers, welders, crane operators and other employees of the construction companies and the client Vendée Eau proudly lined up once the job was done.

1. Belgium
Dr. Andrew Slifka, NIST National Institute of Standards and Technology (USA), and Dr. Holger Brauer at the "Technology for Future and Ageing Pipelines Conference" in Gent at the end of March 2022.

Dr. Gerhard Knauf, GK consulting, Dr. Elke Muthmann, Salzgitter Mannesmann Grobblech, and Dr. Holger Brauer.

2. Germany
Customer visit by members of the Norwegian company Aker Solutions. From left to right: Arve Soegjerd, Bernt Harald Kilnes, Morten Erlandsen, Michael Bick, Arnfinn Øverås and Thorsten Bösch in Hamm in March 2022.

Dr. Georg Golisch, Salzgitter Mannesmann Forschung, at a joint lecture given by Salzgitter Mannesmann Forschung, Salzgitter Mannesmann Grobblech, Mannesmann Grossrohr and Mannesmann Line Pipe on the subject of H2ready®.

6. Norway
Return visit to Aker Solutions in Oslo by Thorsten Bösch and Gerald Peer, Salzgitter Mannesmann (Scandinavia), in May 2022.

5

5. USA
Welcome to the Customer Day in Houston in March 2022. From left to right: Steve Munsell, Stellar Pipe; Hernan Orihuela, Innova Inspection Services; Jess Kindig and Ben Ashley, Weiler Pipe; Stephanie Reed, Salzgitter Mannesmann International (USA); and Andreas Betzler.

5. USA
Michael Kosfeld and Kurt Swendson, Salzgitter Mannesmann International (USA), at the 3rd American LNG Forum in Houston on February 15 and 16, 2022.

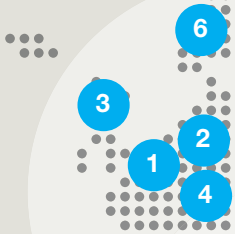
5. USA
Michael Kosfeld and Brandon Mitchell, President Weiler Pipe, Houston, during a golf tournament in aid of the Shriners Children's Hospital in Galveston in May 2022

On the Go – from Global to Local

3. United Kingdom
Thorsten Bösch and Martin Fowler during a visit to the plant of Lundy Projects Ltd., accompanied by Keith Stephens and John Ward.

3. United Kingdom
Guy Barrett, Group Purchasing Director at Barrett Steel Ltd., and Thorsten Bösch.

4. Austria
Mannesmann for water-oil mix. Dr. Juri Rosen accompanies the training of the pipe-laying team of OMV near Vienna in September 2021.



4. Austria
Manuel Simm, Thorsten Schmidt and Alois Kluibenschädl, ALPE PIPE SYSTEMS, at the …

… "ÖVGW-Kongress und Fachmesse Gas Wasser 2022", in Linz in April 2022.

2. Germany
First visit to Siegen in March 2022: Stephan Simon (3rd from the left) introduces new employees of MANFRED REINER Röhren- und Stahlhandel GmbH to Thomas Reinhardt (2nd from the left).

2. Germany
Leonhard Lämmchen and Marcel Giers, Anton Meyer Bauunternehmen, during the qualification test of their own technical components in connection with the terranets Neckarenztalleitung (NET) contract. Also present: Jochen Krämer, Mannesmann Line Pipe.

2. Germany
José Pinto, Mannesmann Line Pipe, Stéphane Toss representing JHC, Valentina Berger and Nicolas Fantin of EURETEQ during acceptance for the SARA Martinique contract in Hamm on December 9, 2021.

Legal notes

Publisher
Mannesmann Line Pipe GmbH
In der Steinwiese 31
57074 Siegen
Germany
Phone: + 49 271 691-0
Fax: + 49 271 691-299
info.mlp@mannesmann.com
www.mannesmann-linepipe.com

Responsible editor
Birgit Quast
Phone: + 49 271 691-201
birgit.quast@mannesmann.com

Concept, editing and design
Kümpel Lorenz GbR, Büro für Gestaltung
www.kuempellorenz.de

English translation
Tim Chafer, Düsseldorf

Mannesmann Line Pipe GmbH
In der Steinwiese 31
57074 Siegen
Germany
Phone: + 49 271 691-0
Fax: + 49 271 691-299

Postal address:
Postfach 12 01 52
57022 Siegen
Germany

info.mlp@mannesmann.com
www.mannesmann-linepipe.com

MANNESMANN
LINE PIPE
A Member of the Salzgitter Group