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SALZGITTER MANNESMANN LINE PIPE

A Member of the Salzgitter Group

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Change and transformation

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Dear Reader:

Even 2,500 years after Heraclitus, it remains an immutable fact that nothing is as constant as change.

And especially in these times, change and transformation are more widespread than ever before. In the transition to the digital society and Industry 4.0, much has changed already or will (have to) change under the impact of globalization.

Salzgitter Mannesmann Line Pipe also has to adapt and to respond to the new environment. Yet our approach will be considered, proactive and visionary, in the best interests of both our customers and ourselves.

In addition to innovations that generate genuine added value for our customers, our focus is on strategic corporate development and process-oriented structures. For one thing seems to be sure: just like no-one steps in the same river twice: the "good old times" are gone forever.

This issue is about the conclusions we are drawing from this scenario and how we address it by choosing and treading new terrain together with our customers and by accessing new markets.

I wish you a stimulating and enjoyable read!

Jörn Winkels
Director Technology and Sales

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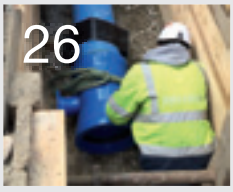
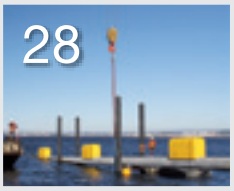
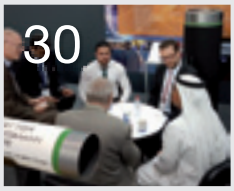






Cover story: Change and transformation

Everything is in flux

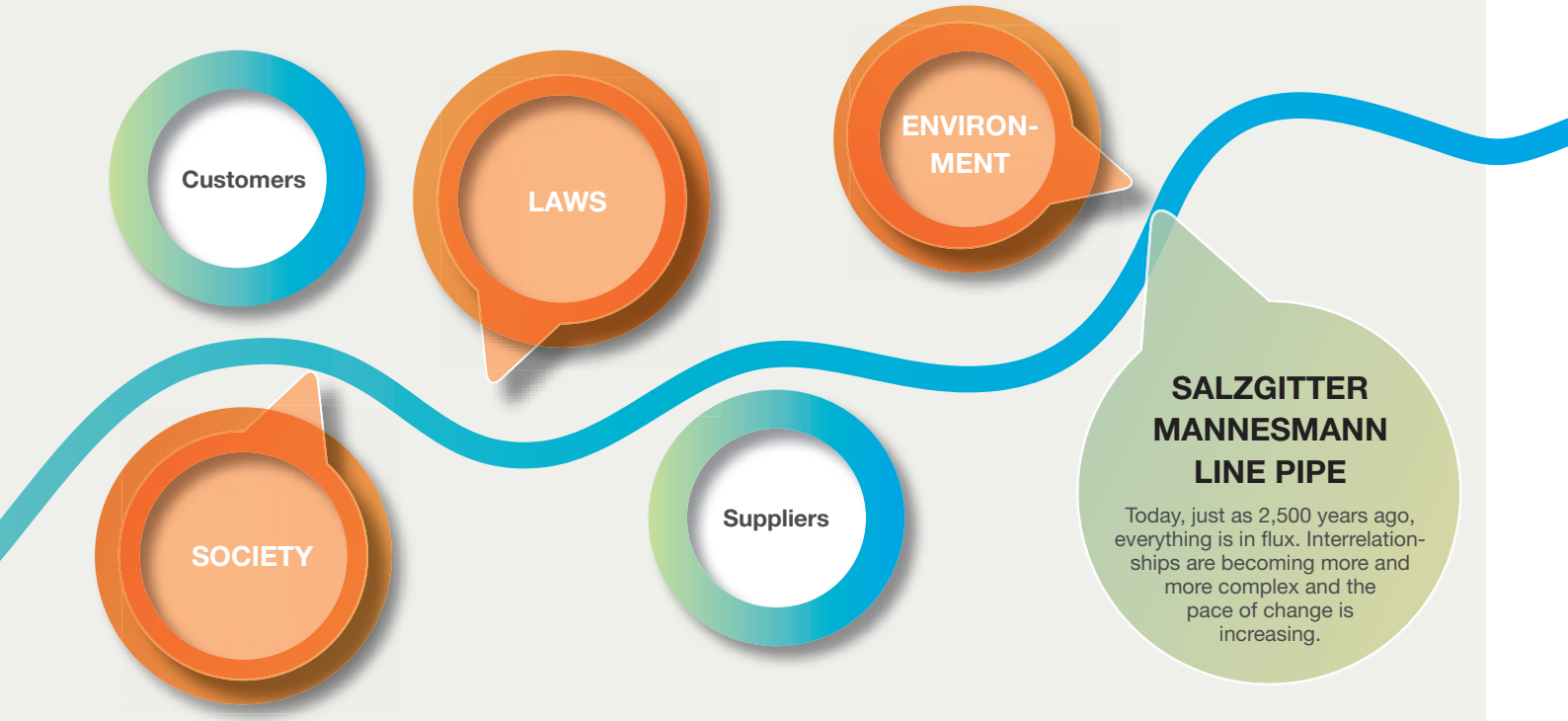
"You cannot step into the same river twice," said the Greek philosopher Heraclitus. 2,500 years later, not only is everything still in flux, but the critical parameters have become more incalculable than ever. Salzgitter Mannesmann Line Pipe has responded to this and is actively shaping change – for itself and its customers.

Globalization, etc.
Globalization, digitization, Industry 4.0, the energy turnaround, cheap imports, the shortage of skilled manpower, oil price trends, and resource management: these are all themes illustrating that the issues that industry has to deal with today are not only growing in number, but are also becoming ever more complex. How are stock market prices reacting, what does this mean for exchange rate parities, and what are the repercussions on economic growth and the oil price? What will be the effects for customers, suppliers, competitors and the market situation, nationally and internationally? The refugee crisis, demographic change, emerging protectionism, and Brexit all compound the volatility of the scenario.

Only one thing seems to be certain: reliable forecasts in the short, medium and long term are becoming more and more difficult, if not impossible.

More turbulence than ever
The once slow-moving river has now gathered pace, and rapids, changing directions of flow, and unforeseeable obstacles are becoming increasingly common. Under these conditions, planning for the long term seems to be a more difficult undertaking than ever.

So as a long-standing manufacturer of HFI-welded steel tube and pipe benefiting from globalized markets and is also dependent on them, how should we act?



A watchful eye on the market, and a focus on the customer

In concrete terms, Salzgitter Mannesmann Line Pipe is experiencing the externally influenced changes like this: under the effect of political uncertainties, rewarding markets are collapsing practically overnight. Contacts with regular customers are severed by protectionism. The fluctuating oil price and currency risks are showing their effects: Projects that appeared to be on the safe side are becoming uncertain or are canceled altogether.

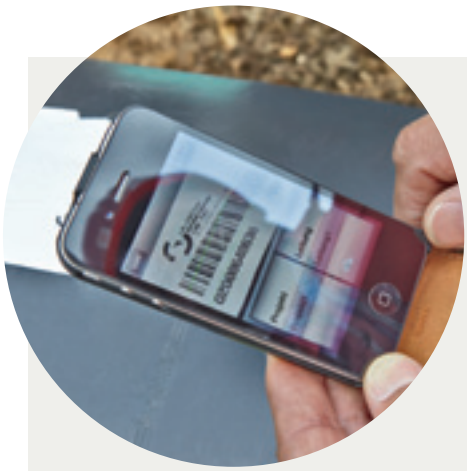
"Responding closely to customer needs, analyzing existing markets, and identifying new market potential still have top priority for us when it comes to strategic corporate development," says Konrad Thannbichler, Sales Director at Salzgitter Mannesmann Line Pipe. "Staying with the 'river' imagery, we can imagine a speed boat that races ahead of the mothership and keenly monitors the banks, the course of the river and rapids, and reports straight back to the bridge of the ship."

The be-all and end-all is still close customer relations. Salzgitter Mannesmann Line Pipe has consistently extended its range of high-quality HFI-welded steel tube and pipe and MSH sections in the last few years.

Thannbichler: "Our customer advisers and sales staff support our customers in their projects from start to finish. Advice covers everything from the choice of laying method and technical specifications through to further processing."

The complete logistics process, including customs clearance, haulage and shipping company paperwork, is all handled single-source at Salzgitter Mannesmann Line Pipe.

For Thannbichler, being close to the customer then also entails local service on the pipe-laying site. "From how customers and processing firms use and evaluate our products, we can draw important conclusions in terms of changes in our product and service portfolio," says the 48-year-old.



Always on the move and up among the leaders

Change is by no means new to SMLP. Thanks to its closeness to and cooperation with customers and partners, the product and service portfolio for our HFI-welding steel pipes and tubes and MSH sections has been steadily expanding over the last few years.

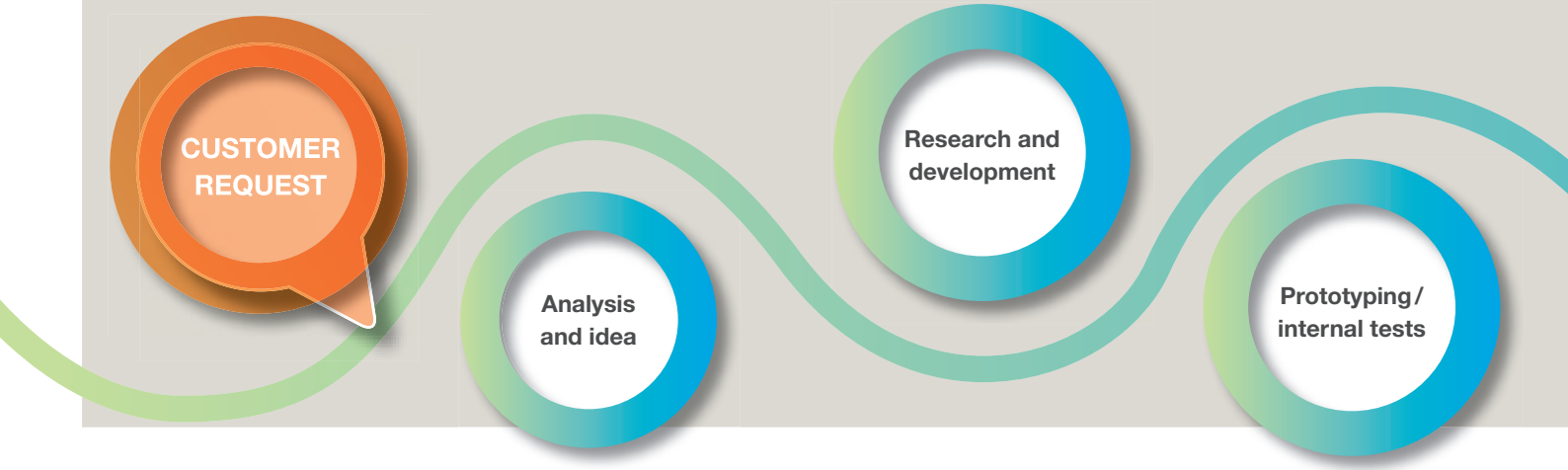
Our consistent focus on the needs and requirements of our customers is a key factor in the ongoing development of our products and services. Change for us is thus an everyday activity and can be observed on a multitude of levels.

Innovative technologies

With research and development, we are constantly advancing innovative technologies for the production, further processing and application of our products:

- **Laser welding**
  In cooperation with the SLV Halle Welding Training and Testing Center, we are working on a project for laser-assisted welding. The objective is to combine the welding and testing of pipe joints in a single operating step. More on page 16.
- **Cathodic corrosion protection**
  Cathodic corrosion protection allows the monitoring and assessment of both new and in-situ pipelines. Salzgitter Mannesmann Line Pipe accompanies the development work and participates in the compilation of corresponding standards.
- **Flowlines**
  Secondary oil recovery places extreme requirements on the steel pipes used in oil gathering systems. Salzgitter Mannesmann Line Pipe has developed a particularly economical system solution for this application. For further information, turn to page 20.
- **ZAP-Lok® connection**
  The patented connection system does without welding by exploiting metal-to-metal friction. The technique is suitable for all common pipeline applications (sour/non-sour gas, oil, water) as well as for offshore and high-pressure pipelines in diameters of 60.3 to 323.9 mm.
- **PMT® lite – app for pipeline management**
  Our app for digital pipeline management – a world-first and now with a proven track record – opens up new scope for on-site work.

From customer request to solution – product development at Salzgitter Mannesmann Line Pipe



Alternative laying methods

When it comes to cost-cutting and environmentally safe laying techniques for pipelines, we assist our customers from project planning through to laying on site. We have a wealth of expertise in the following areas:

- **Trenchless pipe-laying**
- **Plowing method**

Coatings and linings

We have a broad range of options for coatings and linings. New and further developments are available in the following areas:

- **Polyethylene**
- **Multi-layer PP/PA coatings**
- **Maintenance-free corrosion protection for foundation structures in offshore wind parks**
- **Heavy concrete (inside and outside)**

Higher-grade materials

Thanks to the high quality standards of our premium-grade materials, our products are continuously being improved:

- **Structural tube and MSH sections**
  The new MHQ product generation was unveiled at bauma 2016. The high-strength and specially heat-treated tubes and sections combine higher loading capacity with reduced weight.
- **Grade X8Ni9 replaces stainless steel pipes for LNG transport**
  X8Ni9 pipes have been used by FW-FERNWÄRME-TECHNIK GmbH as the inside pipe in FW-KAMMER-PIPE since 2016.
- **Green Tubes J55 UPG**
  These meet the requirements of API-5-CT grade J55 and can be used as grade J55 oilfield pipe. In addition, they can also be subsequently heat-treated to meet the more exacting requirements of N80 Q, L80 and P110.

Certificates

- **Environmental Product Declaration**
  Salzgitter Mannesmann Line Pipe is the first company in Germany to have its Environmental Product Declaration (EPD) verified by Institut Bauen und Umwelt e.V. for the production of steel line pipe. EPDs permit the comparison of various products from the environmental point of view, e.g. in terms of the life-cycle analysis, and play an important part in certification systems for sustainable construction.
- **Energy management**
  Our existing quality management to DIN EN ISO 9001 was extended in 2002 to include environmental management conforming to DIN EN ISO 14001. The energy management system to DIN EN ISO 50001 followed in 2012.

Partners, suppliers, corporation

We always strive for long-term partnerships and customer relations. This makes us a company to depend on.

- **Salzgitter Group**
  Within the Group, we are excellently connected, from steel production and rolling expertise through to further processing.

Many of our customers have to face new challenges. And, as a supplier, we want to accompany the required change processes involved in a proactive manner.

Jörn Winkels

Interview: Change and transformation

"Being a company customers can count on whatever, whenever, wherever"

Diversification, standing out from the competition and developing markets with a healthy future – Jörn Winkels, Chairman of the Management Board, Markus Ketelhut and José Pinto, Business Development & Processes, talk about change and transformation at Salzgitter Mannesmann Line Pipe and discuss the current state of affairs.

All companies are subject to societal, political and economic influences. What are the focal factors for Salzgitter Mannesmann Line Pipe at the moment?
José Pinto: On the societal side, environmental awareness and the responsible use of resources are growing. Climate protection and sustainability have long become political objectives on a global scale. The transition from fossil nuclear energy to renewables means we have to develop marketable products for these new applications. Here we see major potential for growth.

Jörn Winkels: Our core business – steel tube and pipe - is largely dependent on exports for the energy sector. Recently, investment activities in this area have taken a downturn, due to the low oil and gas prices. Other key factors of concern include increasing international

competition, global overcapacities in standard tube and pipe production, which are partly subsidized by governments, and impending protectionism.

How does the company respond to all this?
J. Winkels: The challenge for Salzgitter Mannesmann Line Pipe is to develop our product portfolio in a way that significantly reduces our dependence on strongly fluctuating markets, such as the oil and gas industry. As to the changed scenario in the energy sector, we are affected only secondarily. Many of our customers have to face new challenges. And, as a supplier, we want to accompany the required change processes involved in a proactive manner. Therefore, a central issue in our current strategic orientation is the development of markets with a healthy future.

At the same time, regarding our traditional markets, we intend to differentiate our company even more strongly than before from the competition by offering customers new premium products that bring them a clearly identifiable added value compared to conventional run-of-the-mill.
Markus Ketelhut: For example, to show our customers how responsible Salzgitter Mannesmann Line Pipe handles energy and raw materials, we have compiled life cycle analyses for our products and prepared Environmental Product Declarations to ISO 14025 and EN 15804. These provide our customers with a solid data basis and information about our use of energy and resources. In other words, they represent an ecobalance for the products of Salzgitter Mannesmann Line Pipe. Incidentally, we are the first manufacturer of steel tube and pipe in Germany to be able to present EPDs to its customers.

Change and transformation are steadily progressing processes. What progress has Salzgitter Mannesmann Line Pipe made so far?
J. Winkels: When you look at Salzgitter Mannesmann Line Pipe's history with all its restructurings and mergers, it becomes apparent that the company and its employees have always been able to adjust themselves very well to the most varied situations. What I mean is the company has always responded efficiently to continuously changing market conditions and customer requirements. Innovative coatings, 24-inch pipes or hardening and tempering heat treatments are just a few examples.

Focusing on our customers' needs has always helped us to overcome generally weak market situations and downturns.
M. Ketelhut: However, the current situation in the energy sector and its ramifications inevitably call for a strategic reorientation in the interest of a viable future for Salzgitter Mannesmann Line Pipe and its workforce.

We have therefore initiated a transformation from a functional to a process-driven organization. Here, too, customer benefit is at the focus of the associated changes.

The first step was to establish a customer center and central bidding and order processing. Now we have to develop the new processes in this area further.

We have therefore initiated a transformation from a functional to a process-driven organization. Here, too, customer benefit is at the focus of change.

Markus Ketelhut

Our profitability must not depend on individual sectors or markets, which can always be subject to cyclic fluctuations or political influences.

José Pinto

In what way are you affected by change and transformation in your own area of responsibility?
J. Pinto: In the beginning, change always encounters resistance. Success depends on whether all employees feel totally involved in the change processes both mentally and emotionally. Which is why we considered it particularly important to plausibly explain how our employees benefit from the changes we are aiming at. If the employees can go along with the ccorporate objectives, they will confidently work with greater conviction.
J. Winkels: We want to transfer the positive effects of our customer focus philosophy to the markets of the future. Talking strategy with customers, congress presentations, traveling to customer sites, sharing ideas and experience with potential users are therefore right at the top of our agenda.

To be able to adapt to fast-paced market dynamics, we have established our Business Development & Processes department. Among its jobs are the preparation of market analyses in support of sales operations, a proactive search for new business areas, development cooperation with customers and industrial partners, as well as the generation of new corporate processes and the optimization of existing ones.
M. Ketelhut: As a newly established department, Business Development & Processes has expressly committed itself to communicating information about processes and structures as fully and as transparently as possible.

An important factor we've already realized is that the new organizational structure can only reflect the situation at a given time and that this situation is subject to dynamically changing requirements in the market, from customers, and politicians. So change and transformation will be with us for some time, here and elsewhere.

How are goals and objectives defined and how are they coordinated and implemented across departments?
M. Ketelhut: As I've already said, we want to - and have to – become less dependent on the oil and gas business. Diversification through new products and new customers, meticulous development and marketing of premium products, and increased economic efficiency are what we need to achieve this.
J. Pinto: To pool efforts, we organize regular meetings of working groups across departments and locations. We discuss individual solutions to concrete customer requirements, as well as developing new products and working on enhancing the economic performance of our production locations.

Other objectives emerge from the implementation of measures and actions in the context of our MLP2020 and MLP2021 projects. These mainly concern internal decisions of general relevance to the company.

Does the fact that Salzgitter Mannesmann Line Pipe is a Salzgitter Group company impact on change and transformation processes in any way?
J. Pinto: The closely knit, robust network of Salzgitter Group compa-

nies is of course extremely helpful when it comes to sharing ideas and experience. There's a lot we learn from each other and support is always forthcoming. However, where specifics are concerned, our own skills are called for in adapting and adjusting to what confronts us.

Still, it's certainly an advantage to belong to the Salzgitter AG Group, where new processes are initiated time and again and followed through to completion.

Where do you currently see the biggest challenges and opportunities of change and transformation?

M. Ketelhut: Firstly, a realistic assessment of current market conditions as a guide for our company in thinking ahead and readying itself. With the newly established Business Development & Processes department, we are well on our way. Secondly, it is certainly challenging to move off the beaten track and do things differently. As managers we must conduct ourselves as coaches rather than know-it-all authorities! We have to groom our employees for them to successfully cope with challenges now and in future.

J. Pinto: We have realized that our profitability must not depend on individual sectors or markets, which can always be subject to cyclic fluctuations or political influences.

We must see change and transformation as an opportunity to shape the future of our company by adapting to the market conditions prevailing at a given time.

Will Salzgitter Mannesmann Line Pipe have to reinvent itself under the current conditions?

J. Winkels: We must not lose sight of our traditional virtues and strengths, but neither can we rest on them. That's nothing new. I think we must never stop to continuously question and – partly – reinvent and redevelop ourselves. Today's winners are not the biggest and most powerful but rather the fastest and most innovative.

At the same time, we're not about to chase the latest fad but rather assess carefully by drawing on our wealth of experience what's right for Salzgitter Mannesmann Line Pipe.

What is important, irrespective of any change and transformation, is that we remain a company customers can count on whatever, whenever, wherever. This policy, I feel, offers more rewards than risks. I see change and transformation as opportunities for self-development rather than passive acceptance.

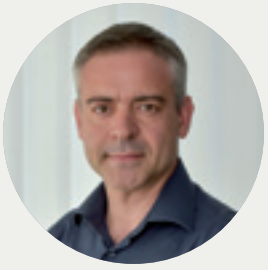
The interviewees

Jörn Winkels,
Chairman of the Board of Management

After studying Mechanical Engineering, Jörn Winkels completed a trainee program at the then Hoesch Rohr AG. Following the merger with Mannesmann he held various staff and line positions. In 2004, he became a director of Mannesmann Line Pipe GmbH in Hamm, a predecessor company of Salzgitter Mannesmann Line Pipe GmbH, and has since been responsible for various management areas. Jörn Winkels is the Chairman of the Management Board and responsible for Technology and Sales.

Markus Ketelhut,
Head of Business Development & Processes, overall responsibility for Customs & Export Control

Markus Ketelhut initially completed an apprenticeship as logistics manager, followed by a continuing training program in transport management and operations at the IHK (Chamber of Industry and Commerce) and studies in logistics (FH/University of Applied Sciences). Before becoming Head of Business Development & Processes at Salzgitter Mannesmann Line Pipe GmbH, Markus Ketelhut was Head of Logistics at the Siegen location.



José Pinto,
Business Development & Processes, OCTG Product Manager

José Pinto is a mechanical and welding engineer. The native Portuguese started his career in the technical sales department of a plant constructor and materials developer for surface technology. He held positions in quality assurance and management and as Marketing & Development Manager for OCTG products in the area of technical sales before moving to Technical Customer Service at Salzgitter Mannesmann Line Pipe GmbH in 2007. Alongside his cross-departmental work in business development, he is OCTG Product Manager and in this capacity the technical expert and global contact for oilfield tubulars.

Photo: © Fair Munich

The new exhibition halls C5 and C6 are virtually identical to Hall 3 (pictured here). HFI-welded steel tubes are now being used for the first time on the challenging roof structure.

Project: Construction of new Halls C5 and C6 at Messe München

"This wouldn't have been technically possible 15 years ago."

Back in the 1990s, exhibition halls with highly ambitious architecture were erected at Munich's trade show center. With the construction of the new Halls C5 and C6 and the Conference Center Nord, the covered exhibition space is set to grow to 200,000 m² by 2018. Involved for the first time are HFI-welded steel tubes from Hamm and Siegen.

The finished hall ensemble is due to look like this as of 2018: Simulation of the new Halls C5 and C6 and the Conference Center Nord in the foreground.

"Messe München is in great shape economically and strong," explained trade show company CEO Klaus Dittrich in his annual review on January 12, 2017. Sales passed the EUR 400 million mark for the first time in 2016. Thanks to reserves and foreign business, which now accounts for 22 percent of total sales, the exhibition company can continue to invest on a large scale – in two new exhibition halls, for example, which are due for completion in 2018.

The difference in the details

This is also the first time that Salzgitter Mannesmann Line Pipe is supplying components for the sophisticated roof structure of the new halls, which are virtually identical to those dating back to 1996 to 1998. The difference can be found, however, in the details – and in by no means unimportant ones. While seamless tubes were exclusively used for the original elaborate steel structure, HFI-welded tubes from Hamm and Siegen are now being utilized as well.

Guido Ludwig, Area Sales Manager Structural Tubes at Salzgitter Mannesmann Line Pipe, explains: "We are delighted that Messe München has chosen our tubes. Longitudinally welded tubes as produced by Salzgitter Mannesmann Line Pipe have now become broadly established as a technical and above all economic alternative to seamless tubes, for example." Ludwig adds: "This wouldn't have been technically possible 15 years ago."

Continuous development of higher grades

The higher-strength grades that Salzgitter Mannesmann Line Pipe is now capable of producing in this area are decisive. In addition, the company can draw on its wealth of experience from numerous challenging steel construction projects in the last few years. "Here we are supported by starting material suppliers and research facilities within the group," adds Manfred Veit of Quality, who has also served steel construction projects like the New Safe Confinement in Chernobyl and the new soccer arena in Danzig for the Euro 2012 tournament.

Groundbreaking on June 28, 2016 (from left to right): Klaus Dittrich, Messe München; Ilse Aigner, Bavarian Minister of Economics and Media, Energy and Technology; Dieter Reiter, Lord Mayor of Munich; Peter Driessen, General Manager of the Chamber of Industry and Trade of Munich and Upper Bavaria; Franz Xaver Peteranderl, Vice President of the Chamber of Crafts of Munich and Upper Bavaria

Photo: © Fair Munich

Photos: © Fair Munich

Spectacular millimeter-precision maneuver: A total of 13 roof trusses per hall were lowered by crane onto the side walls of future Halls C5 and C6. The steel structures weigh up to 92 tons.

"Putting together the best-possible package for the customer."

Higher strength, lower weight, lower price

Numerous design offices, engineers and steel construction companies appreciate HFI-welded steel tubes as the more economic and also technically superior solution. Longitudinally welded tubes can be produced with tighter tolerances, more flexible lengths and a visually better-quality surface. In some cases, it's the fact that they are also lighter than their seamless equivalents that makes spectacular structures possible.

Two suppliers, one package

For the extension of the new Messe München, Salzgitter Mannesmann Line Pipe joined forces with Vallourec in bidding for the project. The two companies are linked by many years of cooperation. In terms of this project in particular, it soon became obvious that certain dimensions could only be produced seamless. On the other hand, the much-demanded diameters of 168.3/244.5/273.0 und 323.9 mm with wall thicknesses of between 5 mm and 20 mm could be produced by Salzgitter Mannesmann Line Pipe at a much more competitive price in HFI-welded steel tubes. Ludwig: "What would make better sense than for us to team up in meeting the technical specifications and putting together the best-possible package for the customer?"

High quality and flexibility are decisive

This package made such an impression on the customer Stahlbau Wegscheid that it ordered a total of 424 metric tons of steel tubes from Salzgitter Mannesmann Line Pipe through Vallourec in January 2016. In addition to the competitive pricing and high product quality, the customer also attached importance to flexibility in production and delivery. For instance, it was always possible to change the exact lengths until shortly before production.

867 tubes for 20,000 m² of exhibition space

From May to August 2016, the steel tubes of grades S235JRH and S355JGH were produced at the plants in Hamm and Siegen and then supplied for further processing to the Wegscheid production location in the immediate

Photo: © Stahlbau Wegscheid

The required components were welded and painted at Stahlbau Wegscheid.

proximity of the German-Czech border. It was here that the precisely cut-to-length tubes were welded into components of the roof frame and painted before being shipped to the outdoor grounds opposite the construction site in Munich at the beginning of 2017. It takes two such components to form a 60-meter long roof truss, 13 of which form the self-supporting roof structure of each hall. Topping out is scheduled for June 20, 2017.

Supplier and exhibitor in one

Messe München is of interest to Salzgitter Mannesmann Line Pipe not only as a customer, but also as an exhibition venue. The pipe manufacturer regularly participates with its own stand in IFAT, the world's leading trade show for environmental technologies. In May 2016, Salzgitter Mannesmann Line Pipe was also co-exhibitor for the first time at "bauma", the trade show for construction machinery with the world's largest exhibition area (see information box on the right).

New MHQ product generation

It was also in this context that Salzgitter Mannesmann Line Pipe premiered its new "MHQ" product generation. Under Guido Ludwig's supervision, suitable trade show samples were presented and new possible applications discussed with the interested professional audience. In the form of high-strength and specially tempered HFI-welded steel tubes and MSH sections, the products of the MHQ generation can withstand higher loads while achieving significant weight savings. "This is where we come full circle. For these tubes are bound to be used in the coming generation of construction machines and in future halls, sports stadiums, and other prestigious architecture," says Guido Ludwig casting an optimistic glance into the future.

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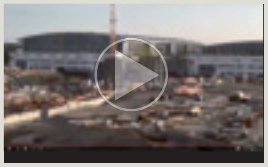


Watch the time-lapse video of the erection of the new exhibition halls at our magazine website.

Photos: © Fair Munich

Messe München – from local to global

With over 50 trade fairs at its Munich location and abroad, Messe München ranks among the world's leading trade fair organizers.

In 2016, events at the International Congress Center (ICM) and the Munich Veranstaltungscenter (MOC/Event Center) attracted close to 37,000 exhibitors and 2.4 million visitors.

Messe München is present around the globe, with a network of associated companies in Europe, Asia and Africa and over 60 foreign representations for over 100 countries. Internationally, trade fairs are organized in China, India, Brazil, Russia, Turkey, South Africa, Nigeria, Vietnam and Iran.

After moving from the center of Munich to the former airport site in Riem in 1998, the trade fair company has one of the world's most modern and sustainable trade fair centers at its disposal and has been certified as an "Energy-efficient Enterprise" by TÜV Süd.

As of 2018, the gross exhibition area, including the two new Halls C5 and C6, will cover some 200,000 m².

The outdoor area of 425,000 m² is the largest of all trade fair companies in Germany.

In all, 213 events and additional guest events were organized under the umbrella of Messe München in 2016. Of these, 16 took place in Munich and 28 abroad. In addition, Messe München hosted 169 congresses and events. The event with the highest visitor turnout – and also the world's largest trade fair in terms of exhibition space – is the triennial construction equipment trade fair "bauma", which was attended by some 580,000 visitors in 2016.

Technology: Orbital laser welding process

Welding and testing in a single step

The installation and testing of pipe joints and the related logistics account for a major time and cost factor in pipeline construction. So the combination of laser beam welding and ultrasonic weld inspection in a single operating step should help reduce pipe-laying time and costs. That, at least, is the theory.

But in current practice, things look a bit different. Two specialist welders, who, incidentally, have become a rare breed worldwide, need between 20 and 30 minutes to produce one pipe joint in a DN 300 pipeline string. Each joint consists of several welding passes.

Once the joint is complete, the weld area has heated up to such an extent that immediate subsequent testing is ruled out. Apart from this, weld testing is usually done by a service provider who will only start working when a larger number of welds have been completed. The resultant delay is carried over to field coating of the welds, so the completion of a single joint can take anything up to several days.

Pipeline revamp as pilot project

In the area of Dersekow, south of Greifswald in north-eastern Germany, the Leipzig-based company ONTRAS Gastransport GmbH is revamping the long-distance gas pipeline 98 in several consecutive sections. The pipes for a recently laid 1,100 m section have for the first time been joined using the orbital laser welding technique.

Aligning steel pipes on the construction site

The prototype immediately shows its enormous development potential.

Salzgitter Mannesmann Line Pipe not only supplied the required 70 pipes in DN 300 and with a wall thickness of 6.3 mm, it is also a co-patent-holder of the orbital laser welding process with subsequent weld inspection.

Development work of many years

Before patent protection was obtained, Schweißtechnische Lehr- und Versuchsanstalt (SLV/Welding Training and Testing Center) Halle and Salzgitter Mannesmann Line Pipe cooperated in the development of the process for several years.

The objective: reduce the time and costs involved in stringing together the steel pipeline.

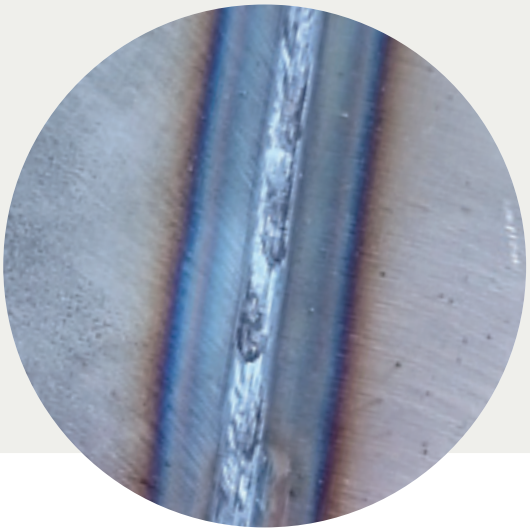
The idea: have laser beam welding and weld inspection together performed by a device that rotates around the pipe, thus completing in a single operating step a pipe joint ready for field coating.

A perfect girth weld in 70 seconds

The first prototype immediately showed the enormous improvement potential of the new device and the way it works. In just 70 seconds, two HFI-welded steel

Orbital laser welding – possibilities and advantages:

- Welding and testing in a single operating step
- Enormous savings in time and costs
- Streamlined and straightforward field coating



Extreme left: In many cases, conventional welds are only tested several days after welding. The weld has corroded and must be thoroughly cleaned before field coating.

Right: The automatically laser welded joint is more uniform and even, and not so bulky. It can be tested and field coated immediately after welding.

Four questions to Dr. Hans-Jürgen Kocks, Salzgitter Mannesmann Line Pipe

Where did the idea come from and when was the development project started?
To begin with, we wanted to reduce the time and costs involved in stringing together the steel pipes, especially as these are frequently seen as a shortcoming of steel line pipe. Initial internal talks took place back in 2006, but it was only in 2009 that we discussed the use of automatic laser beam welding with experts from the SLV Halle. Then we carried out three partial projects, in which we realized two prototypes for this combined welding/testing process. Currently we are optimizing the testing technology within the framework of a further partial project.

What pipe diameters and wall thicknesses can be processed by the new technology?
Our current prototypes cover the range of DN 100 to DN 400, with wall thicknesses of up to 8 mm. But in future, we should be able to process larger diameters and wall thicknesses as well.

Why does the weld cool down so quickly after welding?
The energy input in welding is very concentrated. The high thermal conductivity of steel ensures excellent heat dissipation. Therefore, the surface temperature of the weld areas drops significantly faster than with a conventional welding process.

Where would you see the application range of the new process?
The benefits make themselves felt mostly along straight pipeline sections and hence long pipe strings. But the new process could also be used in trenchless projects, where pipe strings produced on site have to be automatically tested and field coated before being pulled in into the bore.

pipes can be joined by a perfect girth weld. The mobile laser is controlled from a vehicle. "Although we weld at 1,800 °C, shortly on completion of the single-pass weld the material has already cooled down to between 60 and 80 °C," explains Christian Sondershausen, research engineer at SLV Halle.

> *Currently we are optimizing the testing technology within the framework of a further partial project.*
>
> *Dr. Hans-Jürgen Kocks,*
> *R&D Salzgitter Mannesmann Line Pipe*

Subsequent testing no problem
Accordingly, the weld can be tested immediately after welding. "This is another major benefit of the new process. With a conventionally welded joint, we have to wait for quite some time before it can be tested," adds Dr. Hans-Jürgen Kocks, who is in charge of the project at Salzgitter Mannesmann Line Pipe. "This, of course, also increases the logistics effort in a pipe-laying project." Since, in the new process, welding and weld testing are conducted in direct succession, the pipe joint can also be field-coated immediately afterwards. Another benefit that saves time, work and costs.

On track to practical feasibility
In a pilot project near Greifswald, which originally focused on the welding process alone, the developers were completely happy with the performance of the new prototype. "The field test was a success. What we now have to do is couple the weld test to the welding process and integrate it into the welding device," says Dr. Hans-Jürgen Kocks.

And there's more work to be done in the context of weld preparation. Christian Sondershausen: "The alignment and internal centering of the pipes need to be more closely adjusted to the process." For in the field test, the operators took about an hour to position the pipes for laser welding. But the pipe-laying company on site was convinced that there was plenty of improvement potential that can easily be exploited, especially with long pipeline sections.

Acceptance by Germany's TÜV Süd
As the inspectors from TÜV Süd see it, the welding process has proven itself. Besides ultrasonic and X-ray testing, the pipeline was subsequently subjected to a stress test as well. The mechanical properties of the laser weld complied with all the requirements in the applicable standards. All the welds passed the tensile test, the Charpy notch impact test, and the hardness test with flying colors.

In the pilot project, the pipe strings were tested using ultrasonic and radiographic techniques. TÜV Süd found no grounds for any objections.

www.magazin.smlp.eu/en/laser

You can watch our field test video on our website.

IBU Managing Director Dr.-Ing. Burkart Lehmann presenting the verified EPDs to Konrad Thannbichler, Head of Sales at Salzgitter Mannesmann Line Pipe.

> *We expect energy efficiency and environmental compatibility to evolve into weightier order-placement criteria.*
>
> *Markus Westhoff, Technical Services Salzgitter Mannesmann Line Pipe*

Leading in independent Environmental Product Declarations

Salzgitter Mannesmann Line Pipe is the first company in Germany to have received Environmental Product Declarations for its steel tube and pipe production from the Institute for Construction and Environment (IBU) in Berlin.

Four new Environmental Product Declarations (EPDs) have been checked and verified for water line pipe, oil and gas line pipe, oilfield tubulars and steel hollow sections.

EPDs as a logical consequence

Konrad Thannbichler, Head of Sales at Salzgitter Mannesmann Line Pipe, was delighted at the handover of the Environmental Product Declarations by IBU Managing Director Dr.-Ing. Burkart Lehmann on the occasion of "Bau 2017" in Munich: "For more than a decade now, we have been limiting energy consumption in the production of our tube and pipe products to what is technically feasible. Given this, the issuance of Environmental Product Declarations in response to our policy of sustainability is a logical consequence." The EPDs were prepared in cooperation with the main department "Coordination Resource Efficiency and R&D" at Salzgitter Mannesmann Forschung GmbH. Independent verification was provided by the Institute for Construction and Environment (IBU) in Berlin.

Background and value

Structural steel hollow sections are manufactured to standards that are harmonized at European level and subject to the Construction Products Directive. According to the latter, any available EPDs should be referred to in the context of assessments of the environmental impact of buildings. EPDs contain information on the consumption of resources (e.g. primary energy and water) in the manufacture of a product and on emissions into the atmosphere, water and soil. Another focal aspect is the product-specific environmental footprint, e.g. greenhouse and acidification potentials. EPDs thus allow products to be compared according to ecological benchmarks.

EPDs as decision criteria

Markus Westhoff, who was responsible for the introduction of Environmental Management at Salzgitter Mannesmann Line Pipe: "Meanwhile, EPDs are in demand in nearly all application areas, which is why we have also prepared EPDs for oil and gas line pipe and for oilfield tubulars. We expect energy efficiency and environmental compatibility to evolve into weightier order-placement criteria."

In an initial field test, the pipes were exposed to real service conditions for a period of five years. During this time, the pipe string was operated parallel to another pipe system in order to check the resistance of the lining.

Technology: Flowlines for oil gathering systems in water-flooded oilfields

Secondary oil recovery in full flow

Although secondary oil recovery by means of water flooding or re-injection can almost double the recovery rates from oilfields, this technique entails more exacting demands on the steel pipe used in the oil gathering lines. Salzgitter Mannesmann Line Pipe has now developed a particularly efficient system solution to address these challenges.

Primary oil recovery – i.e. by means of the reservoir pressure alone – ranks as a fully developed technology. However, as the reservoir pressure decreases over time, so do the recovery rates.

In secondary oil recovery, water is injected into the reservoir to maintain the reservoir pressure. This raises both recovery rates and the overall recovery from an oilfield quite considerably. The mode of recovery is based on the use of injection lines for the water and gathering lines – or flowlines – for the recovered medium, an oil-water mix.

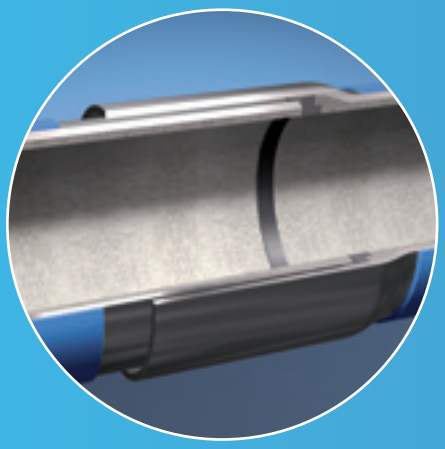
Conveyance of aggressive media

While polyethylene and polypropylene coatings provide for efficient external corrosion protection in all kinds of soil, up to and including severely aggressive, pipes used for conveying hostile media require equally efficient internal corrosion protection. Compared to primary recovery, secondary recovery features significant differences regarding the composition and properties of the media conveyed. Chemical analysis of these oil-water mixes reveals high mineral contents,

HFI-welded steel pipe for oil gathering systems in water-flooded oilfields

Coating / lining

The pipes are coated with polyethylene or polypropylene. The lining consists of modified cement mortar and is applied using a special technique.



Joints

The pipes are assembled using slip welding joints. A stop ring in the socket base prevents damage and spalling during the installation of the joint.

Sealing

Sealing of the pipe joint areas with a special sealant, an elastic thermosetting material, ensures seamless corrosion protection along the pipe string.

the presence of solids and possibly dissolved gases such as H_2S or CO_2. Reinjection of the water also places high requirements on the corrosion protection of the line pipe used.

System solution with modified cement mortar lining

For this application, Salzgitter Mannesmann Line Pipe has developed a system of steel pipes and fittings with a modified cement mortar lining (mCML) and slip welding joints. Precisely matched to the composition of oil-water mixes, the modified cement mortar is applied using a special technique that prevents demixing while ensuring maximum compaction and a smooth surface. The use of slip-welding joints seals the pipes and ensures seamless corrosion protection along the pipe string.

Besides passing its laboratory tests, the system's reliability has proven itself over several years of successful field testing.

Simple pipe-laying

Pipe-laying is facilitated through the use of a caulking tool perfectly adapted to the design of the slip-welding joint. Before lining, an oil-resistant rubber stop ring is placed into the socket base before inserting the spigot end. Firmly anchored in the cement mortar, it prevents lining damage and spalling during the installation of the pipe joint. The joint area is protected with a special sealant, an elastic thermosetting material that is applied to the socket base before inserting the spigot end. After tack-welding the spigot end, any excess sealant can be smoothed out with the aid of a scraper before welding the pipe joint.

Operating pressures up to 200 bar

Depending on the size, the pipes and fittings can be used at operating pressures of up to 200 bar and service temperatures of up to 130 °C.

The lining is suitable for liquid media containing dissolved salts and gases or solids particles and is resistant to alkaline, neutral, and weakly acidic environments (pH >6). The application range may be widened should additional field tests prove successful.

Flowlines

We have compiled all the information on "HFI-welded steel pipe for oil gathering systems in water-flooded oilfields" in a datasheet for you.

www.magazin.smlp.eu/en/flowlines

Photo: © Fotolia

Project: Beatrice Offshore Windfarm Limited

Electricity from offshore wind power for up to 450,000 households

The ever-increasing complexity of projects calls for utmost flexibility of the companies involved in their realization. This also goes for the Beatrice project for the construction of an offshore wind farm off the northeastern coast of Scotland, for which Salzgitter Mannesmann Line Pipe supplied tubes to five contractors in Germany, Poland, Denmark, the Netherlands, Belgium and Scotland.

Smulders Projects was awarded an order for the manufacture of 28 foundation structures. The HFI-welded tubes supplied were used as J-tubes.

Photos: © Smulders

The wind farm Beatrice, situated in the Moray Firth bay, is scheduled for completion by 2019. 13.5 kilometers off the coast, a total of 84 offshore wind turbines will be installed, totaling a generating capacity of 588 MW of electric power from renewable energies. This is enough to power up to 450,000 households.

International operator consortium

The 3.15 billion euro (2.6 billion GBP) project is being handled by Beatrice Offshore Windfarm Limited, an operator consortium consisting of the Scottish energy supplier SSE, Copenhagen Infrastructure Partners, and Red Rock Power Limited, a subsidiary of the Chinese company SDIC Power Holdings Co. The new-generation 7-MW wind turbines to be installed in the wind farm feature rotor blades with a diameter of 154 m. On completion, the wind farm will be operated from its O&M base in Wick.

Erection and connection

The 84 wind turbines of the powerful 7-MW generation will be supplied by Siemens Wind Power. The Energy Management Division of Siemens and the Nexans company will provide for their connection to the grid. Nexans will supply and install the about 260 km cabling required for this purpose. Seaway Heavy Lifting, a Subsea 7 company, will be responsible for the manufacture and installation of the foundation structures and for the installation of the two offshore transformer modules (OTMs) needed for grid connection, which will also be supplied by Siemens.

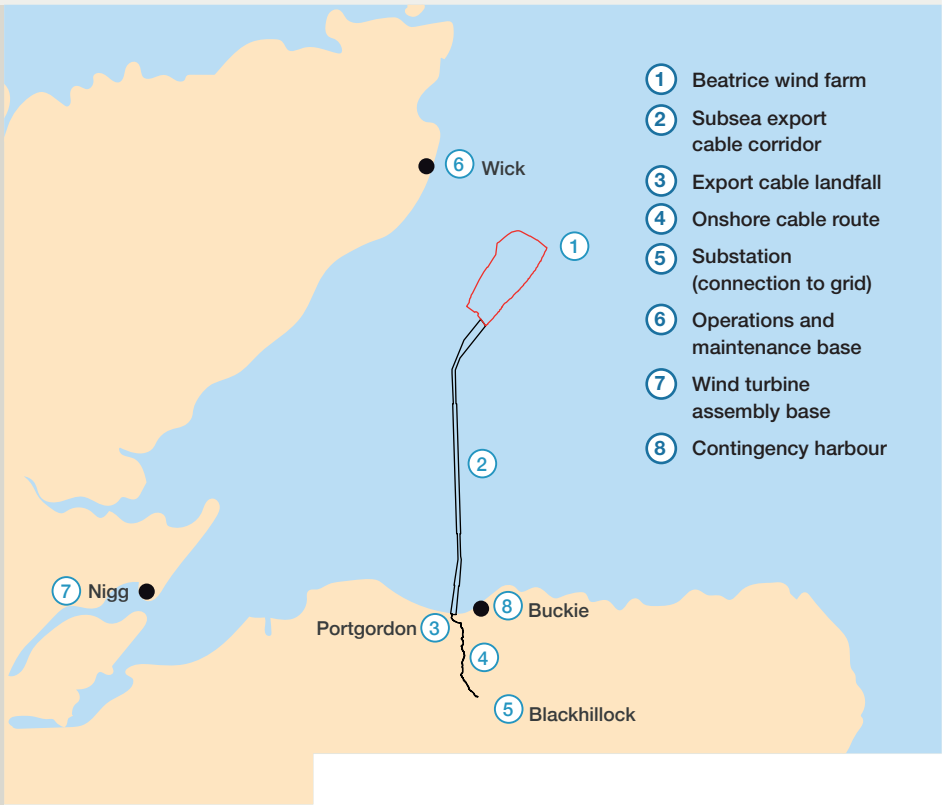
Beatrice offshore wind farm

The European Investment Bank (EIB) has agreed to provide GBP 525 million for the construction of the Beatrice wind farm. This represents the largest loan the EIB has ever granted for an offshore wind project. The 19-year, long-term loan will support more than GBP 2.6 billion (EUR 3.15 billion) of overall investment.

Facts and figures

Turbines: 84 Siemens 7-MW turbines
Height, including rotor: 198.4 m
Rotor diameter: 154 m
Water depth: up to 58 m
CO_2 savings: approx. 840,000 tpy
Planned service life: 25 years

For further information please visit www.beatricewind.com



The 75 m long rotor blades are manufactured in the British town of Hull.

Photos: © Siemens AG

Installation of the turbine foundations

Seaway Heavy Lifting split the contract for the manufacture of the 84 jacket foundation structures. Thirty of them are made at the Danish Lindoe Industrial Park by Bladt Industries, 28 were awarded to Smulders Projects, and the remaining 26 will be manufactured by BiFab at its Burntisland, Methyl and Arnish facilities. The foundations are up to 71 m high and weigh in at up to 830 tons each. They will be set up on an area of 131 km² with water depths of up to 58 m.

Make three plus two from one

What looked like a straightforward parts list to Salzgitter Mannesmann Line Pipe at the time of the project enquiry turned out to be a much more challenging task than previously thought. Given the split orders for the foundation structures, one enquiry had turned into three separate orders from Edgen Murray (UK), Helens Rör (Denmark) and Vallourec in Düsseldorf.

Furthermore, additional quantities had been ordered for the project by the stockists NTS (UK) and Salzgitter Mannesmann Stahlhandel Sp. z o.o. (Poland) via stock orders and framework agreements.

Accordingly complex were the planning and coordination of the orders, which were internally split into lots, from starting material orders through to the production of the steel tubes at the Hamm and Siegen locations.

Deliveries to nine locations in six countries

Things got even more complicated when it came to delivering the finished tubes. The delivery had to be split once again, with further destinations having to be planned and scheduled. In all, deliveries had to be made to nine corporate locations in six European countries. "This project is a typical example of the increasing division of work in many industries," says Guido Ludwig, who was responsible at Salzgitter Mannesmann Line Pipe for the demanding project. "One company alone can no longer offer the complete package at an affordable price."

In all, more than 1,000 tubes were supplied, with diameters ranging from 457 to 610 mm and wall thicknesses of 12.5 to 25 mm. The lion's share was used as cable sheathing tubes on the jacket structures. "It's quite unusual, of course, to have to make deliveries to five dealers and customers at nine locations in six countries – all for the same project." Thanks to the experienced sales and logistics staff it was even possible to accommodate short-term changes and customer requirements.

From Hamm and Siegen across Europe

In all, Salzgitter Mannesmann Line Pipe made deliveries to nine addressees in six countries:

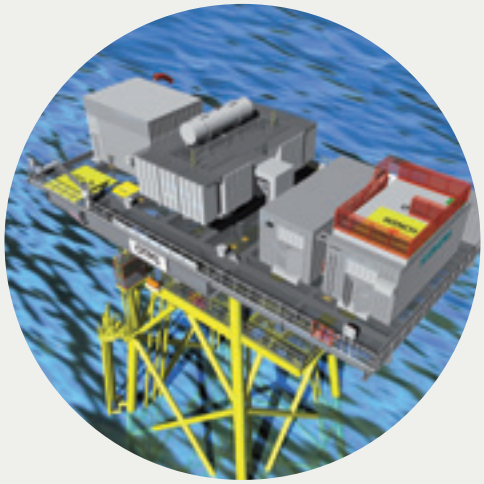
1. Iemants, Arensdonk
2. OGN Group, Wallsend
3. Kersten Europe, Wanssum
4. Edgen Murray, Newbridge
5. NTS, Thirsk
6. Vallourec, Düsseldorf
7. Helens Rör, Middelfart
8. Salzgitter Mannesmann Stahlhandel Sp. z o.o., Słupca
9. Spomasz, Żary

Novel grid connection

For the first time, connection to the mainland grid will be effected via a modular concept with two offshore transformer modules (OTMs), which will collect the generated electricity and transform it from 33 kV to 220 kV for transmission to the shore via two 69 km cables. The modules are one third smaller and lighter than a conventional alternating-current transformer station and expected to reduce connection costs by about 40 %. In a further transformer station on the mainland, the electricity will be transformed to 400 kV and then distributed further inland.

Offshore power for less than 8 euro cents/kWh

With the completion of the new wind turbine blade manufacturing plant in the British town of Hull in 2016, and nacelle production in Cuxhaven, Germany, beginning in mid-2017, Siemens is expecting an efficiency boost in wind energy generation. The enterprise announced that it will bring the cost of power generation from offshore wind down to less than 10 euro cent per kilowatt-hour by 2020, and to less than 8 euro cent by 2025. Offshore wind farms will thus generate power that is both ecological and economical. Beatrice will contribute towards this as early as 2019.



Visualization of the new offshore transformer module.
Picture: © Siemens AG

Picture: © Fotolia

Amortization and energy balance of wind turbines

Although wind power enjoys a green reputation, the construction of offshore wind farms is extremely complex and energy intensive.

In November 2014, Siemens Wind Power prepared an ecobalance of its products. One important factor is an analysis of the product life cycle in the payback period during which a wind farm generates the amount of energy it consumes throughout its entire life cycle, for example, in production, construction and disposal.

The payback period for an onshore wind farm with an average speed of wind of 8.5 m/sec is a mere 4.5 to 5.5 months. This figure also takes into account material, production, operation, maintenance, dismantling and recycling.

Compared to this, offshore wind farms have a longer energetic amortization period, namely between 9.5 and 10.5 months. The study shows: offshore wind farms compensate their allegedly energy-intensive construction within just a few months – with a total service life expectancy of up to 25 years. One of the wind farms examined for the study had 80 6-MW turbines, which generate 53 million MW of electricity during their expected service life of 25 years. The CO_2 emissions per kilowatt-hour (g/kWh) amounted to 7 grams. By comparison: energy from fossil sources pollutes the environment with 865 g/kWh on average. Accordingly, a wind farm saves a total of 45 million tons of CO_2 over its entire service life.

Photo: © Siemens AG

Especially in congested downtown areas or when space is at a premium, it is important to be able to react to technical and local contingencies during pipe-laying. The Fuchsrohr pipe system allows on-site cutting to length wherever necessary and the residual pipe length can be used without any wastage.

Technology: System Fuchsrohr pipe in Austria

Ingenious system for municipal water supply

Ninety percent of the Austrian population are connected to the public drinking water network and supplied with top-quality drinking water by some 5,500 water utilities. To help ensure this service, HFI-welded System Fuchsrohr steel pipe is on permanent duty.

For as long as 23 years, ALPE Kommunal- und Umwelttechnik GmbH & Co KG has delivered longitudinally welded steel pipe from the "Fuchs Rohr" company, a predecessor of Salzgitter Mannesmann Line Pipe in Siegen, Germany. System Fuchsrohr pipe with its high-grade corrosion protection met with ready acceptance on the Austrian market, winning notable customers from the municipal water supply sector, such as Salzburg AG, the public utilities of Innsbruck, Kitzbühel and St. Pölten, plus numerous Water Boards. The integration of the Fuchs Rohr company into the Salzgitter Group and the associated changes to its manufacturing program gave rise to an unexpected delivery bottleneck for ALPE and its customers from the water sector, which had to be eliminated for good.

System take-over by ALPE

In 2012, ALPE acquired all intellectual property rights to the "Fuchs-

The ALPE Fuchsrohr system and its range of valves, fittings and pipeline accessories are permanently on stock in the most common dimensions from DN80 to DN300. The inventories required for this 24 hour/7 days customer service are worth about 1 million euros annually.

Our cooperation with ALPE started almost twenty years ago, during which time the Fuchsrohr system has fulfilled expectations in every respect.

Ing. Gerald Mitterer,
Head of the Kitzbühel municipal utility

rohr System" and its accessories. Over the years, the system has been continuously improved and is now chiefly marketed as HFI-welded steel pipe with plain ends and without sockets.

The steel pipes and the high-quality coatings and linings are still being supplied by the Hamm and Siegen plants of Salzgitter Mannesmann Line Pipe to ALPE's location in the Tyrolian town of Stams, where they are cut to length and accessorized to the customer's specifications.

Current delivery program

System Fuchsrohr pipe is currently available in outside diameters of 80 to 300 mm and mill lengths of 6 and 12 m, with or without pre-assembled socket joint.

A comprehensive portfolio of fittings and accessories rounds off the delivery program, expanding it into a system for all applications in pressure pipeline construction.

Sockets for force-locking and non-force-locking joints

Fuchsrohr pipe can be made up without or with axially force-locking joints, depending on whether Tyton® or DKM® sockets are used, and on the intended service pressure which can range between 25 and 40 bar. The maximum permissible deflection between two consecutive pipes is 5° or, in the case of double socket joints, 10°. This reduces the number of pipe bends and fittings required which, especially in conjunction with ALPE pipe-laying devices, makes pipe-laying a lot easier. In addition, the pipes can be easily cut to length on site for close-to-wasteless processing.

High system compatibility

Due to the standardized diameters, the Fuchsrohr system is compatible with most valves, fittings and other pipe systems in the market. Besides classic water supply, the system is also used in drinking water power plants and fire-fighting water supply in tunnels and industrial plants. Appropriately lined pipe can also be used for transporting wastewater, brines and other liquid media.

www.magazin.smlp.eu/en/alpe

To watch the application videos, visit our website.

Project: Geostock pipeline replacement in the south of France

Safely connected

To increase the reliability of mineral oil products supplies in France, the Geosel company was founded in Manosque in the Provence region as early as 1969. Besides 35 caverns, Geosel operates a pipeline network of some 320 km. After almost 50 years of problem-free operation, an offshore section of this network has now been replaced in the Étang de Berre lagoon.

In all, Geosel operates 26 caverns for fuels, such as heating oil, diesel, naphtha, super gasoline and kerosene with a total storage capacity of about 11 million m³. Another seven are connected to the methane gas terminal in Fos-sur-Mer and serve for the storage of some 2.5 million m³ natural gas. In addition, there are two sole caverns and about 320 km of pipelines which interconnect the local refineries and petrochemical complexes and link them with the national and international pipeline network. The fuels to be stored are transmitted at an operating pressure of 70 bar from Fos/Lavera to the pump station in Rognac, before being fed into the respective Geosel caverns situated at depths of up to 1,000 m.

Top: To start with, the pipes were welded together into four sections. Right: Olivier Boinot, SPIE CAPAG's technical site manager, and Vincent Bertolone on the construction site near Berre in the south of France.

Almost 50 years in continuous operation

Routine checks revealed that a pipeline that had been in continuous operation for almost 50 years in the Étang de Berre lagoon at a water depth of 8 m was showing initial signs of corrosion. To eliminate the risk of this developing into an environmental disaster, it was decided to replace a 1.3 km pipeline section as quickly as possible.

However, it was anything but easy to contract a pipe-laying company for such a short offshore section. The challenge was the disparity between the enormous technical effort and the short length of the section to be replaced. In addition, the space available for the storage of the pipes delivered and for welding the pipe string was rather limited.

A tight schedule for production, processing and delivery

Eventually, Geostock as the pipeline operator managed to contract SPIE CAPAG, a VINCI company, for the pipe-laying operations. The project was meticulously planned in close coordination between the two companies and Salzgitter Mannesmann Line Pipe. Vincent Bertolone, who was responsible for the project at Salzgitter Mannesmann Line Pipe: "Given our successful cooperation with Geostock since 2002, we went along with the admittedly extremely tight schedule for the production, processing and delivery of the pipes required."

The pipes manufactured by Salzgitter Mannesmann Line were provided with a 3 mm HDPE coating, which was specially roughened as a preparation for the top coat of heavy concrete applied by Conline in the Netherlands to a thickness of 60 mm. From there, they were delivered by truck to the construction site in the south of France just in time. SPIE CAPAG thus had enough time to make four pipe strings of the 116 HFI-welded DN 500 steel pipes with wall thicknesses of 10 and 11 mm. These had to be stored in parallel for the time being, due to the restricted space conditions.

Keeping the fingers crossed for good weather

The next thing was to keep fingers crossed for favorable weather conditions, so as to find a time window for pipe-laying. When stable conditions were on the horizon, the pipe string was welded together, and all welds were field coated with cement mortar.

Vincent Bertolone had especially traveled to the site from Germany. "Given the tightly coordinated planning and the complex offshore pipe-laying operations, it went without saying that we would be there to watch over the progress on site," was the comment of the sales region manager.

After careful preparations, the 500-ton pipe string fitted with special buoys was laid from a pipe-laying vessel with the aid of cranes within three days.

Commissioning and a new order

This done, the new string was connected to the existing Geosel pipeline in Marignane with the aid of a special coupling.

During the ceremony to mark the start-up of the new pipeline section, Geostock project manager Pierre Roux expressed his satisfaction: "The planning and completion of the work went without a hitch. Our long-standing close cooperation with Salzgitter Mannesmann Line Pipe has once again paid off."

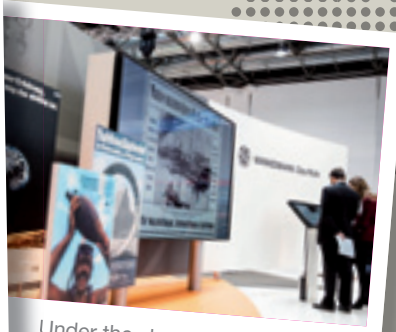
But there was more in store. Vincent Bertolone managed to acquire a similar project in the Brittany region. "Who knows, this may be the beginning of a beautiful relationship as with Geostock in the south of France?!"

A special coupling from the USA was used to connect the new pipeline section with the existing pipeline.

On the go – from global to local

1. Abu Dhabi Burkhard Rossow, Ashish Visvaneth (from left) and Björn Steffes (2nd from right), Salzgitter Mannesmann International's office in Dubai, talking with customers at the Adipec 2016 Oil & Gas Show.

2. Germany
Trade fair participation at the joint stand of Salzgitter AG at Tube in Düsseldorf, April 2016



Under the slogan "Mannesmann. Das Rohr.", visitors were invited to a multimedia experience of the Mannesmann brand

7. Bolivia
At an open informative event at the Camino Real hotel in Santa Cruz, Paulo Santos presented the product range of Salzgitter Mannesmann Line Pipe

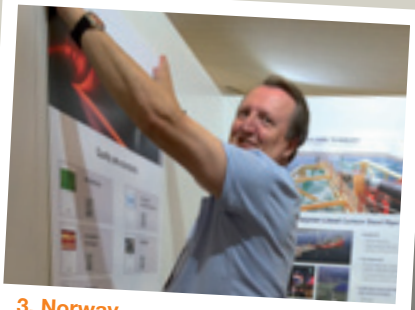
From left: Paulo Santos, Dr. Michael Biste, Honorary Consul of Germany in Santa Cruz, and Oscar Jimenez, a partner in Salzgitter Mannesmann Line Pipe's representation Petrosoil Servicios Integrales in Santa Cruz

6. Spain
Frank Meyer, FW Fernwärme Celle, and Michael Bick at the LNG Summit in Barcelona on April 24 and 25, 2017

The lectures on LNG were well attended

2. Germany
Visitors to our stand at the Oldenburg Pipeline Forum on February 9 and 10, 2017

2. Germany
Customer Conference on Trenchless Pipe-laying held in Siegen on March 2 and 3, 2017



3. Norway
Martin Fowler, Salzgitter Mannesmann (UK) Ltd., at the ONS 2016 trade fair stand in Stavanger

2. Germany
Olesja Krüger and Michael Bick with representatives from Edgen Murray and EnLink (USA) in Siegen

5. Austria
Alois Kluibenschädel, ALPE Tirol, and Wilfried Zankl, Administration of the City of Vienna, during acceptance procedures with Dr. H.-J. Kocks in Siegen

4. Australia
Employee of DBP Australia during order acceptance in Siegen

Pipe-laying preparations for the connecting pipe to the Tubridgi gas storage facility

Legal notes

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