

LINE PIPE GLOBAL

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 **SALZGITTER
MANNESMANN
LINE PIPE**
A Member of the Salzgitter Group

Issue 08 · June 2015

Tradition and innovation

Shaping the future with 130 years' experience

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Dear Reader:

The concepts of "tradition" and "innovation" don't appear to have much in common at first glance. For tradition seems to be more rooted in the past and innovation geared to the future. However, a closer look will soon reveal that the terms – at least for our company, Mannesmannröhren-Werke, and the Salzgitter Group – are in fact closely related.

We regard tradition not as backward-looking, but in fact as the foundation for our future. We as a company and our customers benefit equally from the numerous strengths that we have developed and acquired in the course of time – due to the ongoing refinement of our innovative products and services.

In our cover story, we run the gamut from the beginnings of brothers Reinhard and Max Mannesmann through to the future. We take a look at the field of research & development so important for innovation and also illuminate the role that women play in our company. We report on the current state of practical use of our PMT® lite, the world's first app for mobile operations at the pipeline, and on our Offshore Day devoted to an exchange of ideas and views among developers, manufacturers, users and customers.

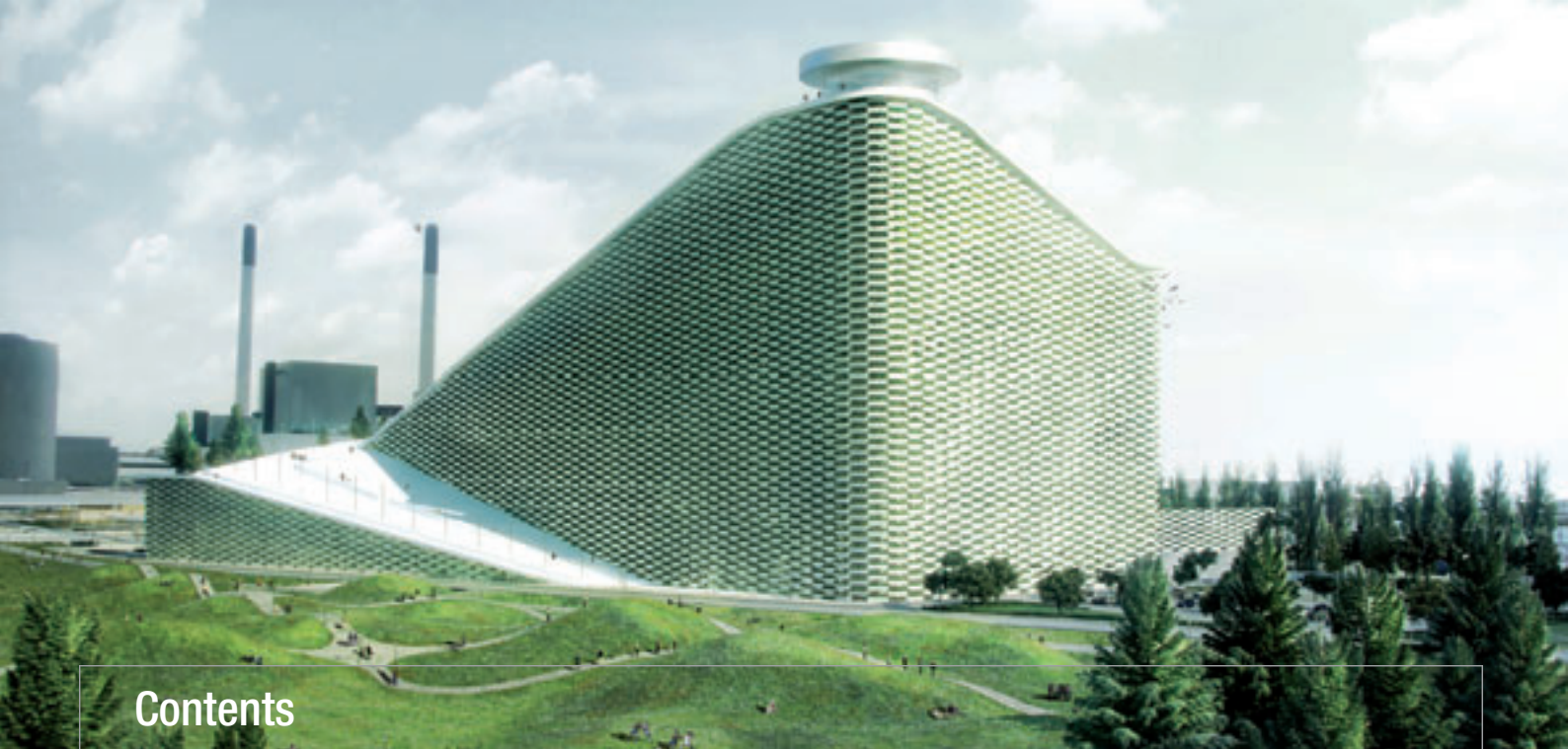
As always, of course, we also present a selection of exciting projects. We kick off in Copenhagen with the spectacular project of a waste incineration plant on which

skiing will be possible on high as of 2017. From the High North, we then plunge to the depths of the "Katharina" underground gas storage facility in Saxony-Anhalt and from there to the Swabian Jura. We drop in on Vienna's Technical Museum and, to round things off, we take a trip Down Under and report on our first project in Australia.

And while we're on the subject of premieres, the new issue of Line Pipe Global is now available for the first time in a Web edition. Here, again, we want to offer you an innovative service – read it when, where and how you like, as a printed magazine or an online edition at www.magazine.smlp.eu

And now enjoy what we hope will be a stimulating read!

Heinrich Clören
Managing Director Sales & Marketing



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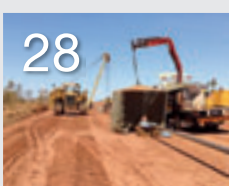
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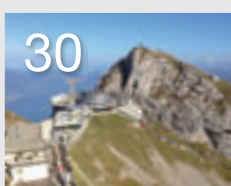
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Cover story

Tradition and innovation



The first process for the rolling of seamless steel tubes developed by company founders Reinhard and Max Mannesmann in the 1880s revolutionized pipeline, machinery and vehicle construction. In 1897, the company also embarked on the production of longitudinally welded steel pipe. Mannesmann steel pipe soon became synonymous with supreme quality and reliability worldwide, as can be seen from the use of seamless steel tubes by the Australian Gas Light Co. in 1910. The history of today's Siegen location of Salzgitter Mannesmann Line Pipe GmbH goes back to about the same date.



From production via quality assurance, training and consulting through to practical application - Salzgitter Mannesmann Line Pipe stands for innovative products, services and solutions.

Mannesmann welded
socket pipes being laid
in Argentina, c. 1907



Tradition and innovation

Much achieved but much more ahead

Mannesmann steel tubes, for which brothers Reinhard and Max Mannesmann filed a patent in 1885, soon became a global byword for ultimate quality and reliability. Today, they stand for 130 years' experience as a basis for shaping the world of tomorrow.

What started in 1890, when the first-ever high-pressure oil pipeline was laid through the Caucasus, has become the lifeline of our globalized economy: the worldwide efficient and safe distribution of energy carriers – mineral oil and natural gas – via a grid of steel pipelines several 100,000 km in length.

Steel tube and pipe and MSH sections from Salzgitter Mannesmann Line Pipe and Salzgitter Mannesmann Großrohr are also used in numerous other applications. From energy and water transportation to storage caverns and district heating systems for the reduction of CO₂ emissions right up to ultra-modern stadium and

building construction projects, offshore wind parks and intelligent waste disposal strategies in metropolitan areas and conurbations.

Getting better and being better

Innovation is development and progress – getting better and being better. Making better products, implementing better processes, and providing better services.

Our continuous improvement in all these areas is based on our traditional strengths: research & development, production expertise, the training of skilled workers, quality, reliability,

internationality, close intra-group ties, continuity and customer focus. All this combined helps us to develop innovative products, applications and services.

Traditional strengths – innovative products and applications

Consistent focusing on the needs and requirements of our customers plays a central role and will continue to do so. With PMT® lite – the world's first app for mobile pipeline operations – we are opening up completely new possibilities for our customers. To ensure maximum added value and easy handling, we are involving future users in the development



Future users have been intensely involved right from the start in the development of the world's first app for mobile pipeline operations – PMT® lite.



We regard tradition not as backward-looking, but in fact as the foundation for our future.

Heinrich Clören, Managing Director Sales & Marketing





and implementation of ideas right from the start. This is just one example of many showing how we develop innovative products with a focus on customer needs.

Technical and social competencies

This development of new solutions tailored as closely as possible to customer needs is made possible by our broadly based production technology and – above all – by our employees. Sound training of skilled workers, dual study courses, occupational development and advancement measures, family friendly working hours and back-to-work programs are no passing fads for us but have long been firmly anchored in our corporate culture.

Besides purely technical aspects, social competencies have increasingly gained importance when it comes to recognizing customer needs and converting them into innovative solutions. Introductory, intermediate and advanced training courses enable our employees to emphasize our strengths such as continuity and customer focus.

Much achieved but much more ahead

We don't intend to rest on the laurels of 130 years' experience. Understanding our customers, recognizing their needs as well as relevant trends in good time is still as important as ever in the development of innovative products and applications. This is how we safeguard our competitive edge and sustainability.

130 years of production expertise, continuous research and development, and the highest quality benchmarks ensure innovative products that meet the growing demands of our customers as well as setting new standards in application technology.

Traditional strengths

Research & Development

The company founders Reinhard and Max Mannesmann patented over 1,000 technical ideas and improvements. And research and development still assume a central role in the implementation of innovative ideas.

Customer proximity

Our service is customer-oriented, readily accessible and committed. We advise, accompany and support our customers through all the phases of their projects.

Close intra-group ties

The Salzgitter Group is based on strong partners and close ties. We are optimally interlinked – from steel production and rolling competence right up to processing and fabrication.

Continuity

We pursue our targets with perseverance. Strategies, partnerships and customer relations are built on a long-term basis.

Innovation

Production expertise

130 years' experience in the manufacture and processing of steel tube and pipe. Expertise in which we are second to none.

Quality

The name Mannesmann stands for maximum product quality around the globe. This was true from the start and still is today.

Personnel training and development

The training of skilled workers as well as ongoing personnel development is an important factor in maintaining our competitive edge.

Reliability

A promise is a promise. We guarantee agreed deadlines, qualities and delivery quantities.

Internationality

The very first high-pressure oil pipeline using Mannesmann line pipe was laid in the Caucasus back in 1890. Our business has always been and will continue to be international in every respect. Our employees altogether speak 13 languages either as their native tongue or as a second or third language.

Innovative products and applications

Line pipe

Our line pipe for the transportation of gases, combustible liquids and solids conforms to EN, API, ISO, GOST and DNV requirements. It is made to the most stringent specifications of renowned national and international oil and gas companies.



OCTG

Uniform pipe wall thicknesses and minimum out-of-roundness, coupled with outstanding collapse resistance. Conforming to API 5 CT and available in steel grades H 40, J 55, K 55, N 80 and HC 80.

Offshore wind energy turbines

High-grade hollow sections, cable conduits and corrosion protection for durable, economic wind park solutions.



Water pipe

A wide range of joints and connections, innovative coatings and linings for the most demanding applications in industrial plant and water pipelines.



Storage caverns

Underground storage and extraction of gas invariably involves extremely high pressures. Here, our pipes serve as safety-critical components under continuous dynamic stresses.

Structural tubes and MSH sections

Round, square and rectangular hollow sections for various types of buildings to facilitate optimal structures and encourage new architectural solutions.



Pipe for district heating systems

High-grade steel pipes (medium pipe and shells) for thermally insulated and electronically monitored pipe systems. Many years' experience with large projects and a wide range of pipe-laying and pulling processes.

Advice and services

Present around the globe

Our consultants and sales staff are at your side throughout all phases of your project. From the enquiry stage to the selection of the best-suited pipe-laying technique, technical specifications, processing and fabrication to logistics handling, complete with customs, carrier and shipping procedures, right up to the application of our products on the construction site.





Technology – app-based pipeline management

App for greater transparency and safety

PMT® lite, the world's first mobile app for digital pipeline management, opens up new possibilities for mobile operations at the pipeline. In a project involving the relocation of a high-pressure gas pipeline, Köster GmbH has now tested the new app in the field for the first time. Their experience shows that the app will not only save labor enormously, but also enhance transparency and safety.



The construction site near Scharenstetten on the Swabian Jura. In the course of the construction of the new ICE route between Stuttgart and Ulm and the widening of the A8 freeway, two high-pressure gas pipelines had to be relocated.

Left: The smartphone's camera function identifies and locates the pipes in a single step. The logged pipe number contains all the key technical data needed for single pipe tracing.

Right: Installing a fitting. These pipeline segments were also digitally logged by PMT® lite.



The safety standards of Deutsche Bahn (German Railways) and the Federal Highway Directorate are stringent: Pipelines buried near rail or road routes must withstand extremely high static and dynamic loads. During construction of the ICE route between Stuttgart and Ulm and the three-lane widening of the A8 freeway running alongside it, two existing high-pressure gas pipelines near Scharenstetten on the Swabian Jura had to be relocated and reinforced.

Field testing under real-life conditions

For Köster GmbH this was a perfect project for testing the PMT® lite app developed by Salzgitter Mannesmann Line Pipe. Given that the two pipelines are the main arteries of the southeast terranets pipeline grid, reliable supplies had to be guaranteed throughout construction.

"We wanted to have the app tested under real-life conditions and find out to what extent our technical innovation

lives up to our expectations in everyday practice," says Dr. Hans-Jürgen Kocks of Salzgitter Mannesmann Line Pipe, who played a key role in the development of the app.

Digital from the start

The pipe numbers were scanned by smartphone and assigned directly to the corresponding GPS coordinates. Then the welded pipe strings were recorded complete with the necessary fittings. This straightforward collection of the pipe data saved an enormous amount of time for the employees of Köster GmbH. In addition, by overcoming the need to transfer the extremely long pipe numbers by hand, a potential source of error has been eliminated.

Sustainable quality assurance

With the pipes successfully relocated, Jürgen Höchst, the project engineer in charge at Köster GmbH, was delighted with the outcome of the PMT® lite test.

"PMT® lite is an exceedingly versatile tool." In his view, "the app will make pipe identification much easier, and the direct digitization of pipe data will ensure greater transparency and safety from now on."

The directly available digital data thus allow progress on the construction site to be tracked from anywhere around the globe. As Jürgen Höchst puts it in conclusion: "The documentation of key pipe data right through to single-pipe tracing is another important contribution to sustainable quality assurance."

PMT® lite – the world's first app for mobile operations at the pipeline

PMT® lite opens up entirely new possibilities for mobile operations at the pipeline. If you are interested in further information or wish to test the app yourself, please contact your responsible regional sales manager or send an email to pmt@smip.eu.



The documentation of key pipe data right through to single-pipe tracing is another important contribution to sustainable quality assurance.

Dipl.-Ing. Jürgen Höchst, Köster GmbH



Research & Development

Improvements in the pipeline

The development of innovative products and improvements in quality standards are closely associated with the fields of research & development. For the Salzgitter Group, they play a central role in the realization of innovative ideas, even today. So central that this task has been entrusted to an entire company within the Salzgitter Group – and not just as of late.

Test and research findings pave the way to new applications like that of HFI-welded steel tubes in the foundation structures of offshore wind turbines.



Experimenting, tinkering, trying things out, and thinking differently and out of the box – company founders Reinhard and Max Mannesmann must have had this in their genes. Over 1,000 technical ideas and refinements are attributed to these two brothers. The role that research & development still play in the Salzgitter Group today can be seen from the fact that an entire company is devoted to them.

A history of research & development

There is a tradition of research & development at Mannesmann and in the Salzgitter Group. The Mannesmann Research Institute was founded in Duisburg back in 1934 as a practice-related research facility belonging to the then Mannesmann Group. The history of the Materials Center in Salzgitter also goes back to the end of the 1930s. Today's Salzgitter Mannesmann Forschung GmbH (SZMF) came about in 2004 through the pooling of the research activities of the Salzgitter Group. At the Duisburg and Salzgitter locations,

some 300 members of staff active in eight main departments today conduct research & development work relating to the material steel.

Cooperation within the Group

Cooperation between Salzgitter Mannesmann Line Pipe and Salzgitter Mannesmann Forschung GmbH goes back many years. In addition to developing and refining high-grade steels, the pipe maker has its biggest focus on the field of application-related testing.

Large components testing is therefore the day-to-day activity of the Component Safety department at Salzgitter Mannesmann Forschung GmbH. Steel pipes can be tested among other things as follows:

- Internal pressure tests/burst tests and pulsating internal pressure tests
- Collapse tests to determine behavior on exposure to external pressure, e.g. when laid in deep-sea environments
- Pipe bending tests to investigate multi-axial load-bearing behavior with and without internal pressure

Application-related component testing

"We conduct component tests to determine the mechanical load-bearing behavior, and particularly the strength, deformation and fracture behavior, and structural durability under service conditions," says Dr.-Ing. Susanne Höhler, head of Component Safety. "The findings also help us to give our FEM calculation models an experimental foundation."

In the testing of line pipe, it is a question of qualifying new products and pipe grades, identifying load-bearing reserves for the assessment of pipeline safety, and simulating pipe-laying conditions. For instance, we replicate the stressing of line pipe laid in marine environments in collapse tests, while laying processes such as reel laying and S-laying are simulated with bending tests.

Elaborate new test method

Multi-axial load-bearing behavior has become increasingly important in the last few years. "Multi-axial load conditions can occur on a line pipe when,

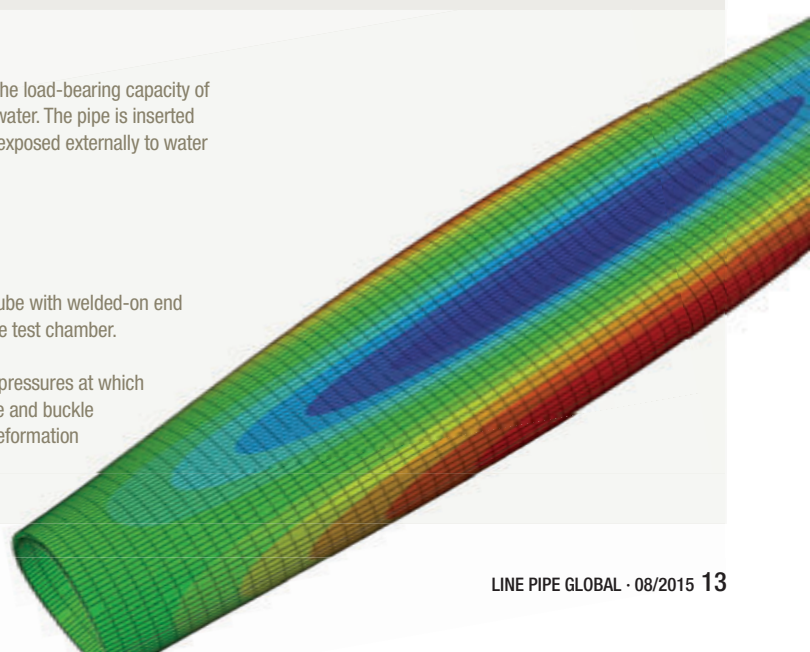


Collapse tests

Collapse tests investigate the load-bearing capacity of empty line pipe laid underwater. The pipe is inserted into the test chamber and exposed externally to water pressure.

Left: An HFI-welded steel tube with welded-on end caps being inserted into the test chamber.

Right: The test reveals the pressures at which line pipes become unstable and buckle (collapse pressures) and deformation behavior during buckling.



Burst tests

In burst tests, end caps are welded onto the pipes to create containers. The internal pressure is usually applied by filling them with water. Burst pressures and burst behavior (fracture surface and type) and deformations are measured. In pulsating internal pressure tests, pressure cycles are built up to determine fatigue strength.

Right: The evaluation of burst test data allows us to optimize the properties of our pipes for economic production and safe pipeline design.



for example, it is exposed to external deformation and forces from bending or ground movements," Höhler explains. They cannot be prevented from affecting pipelines and can be expected to occur more and more often. This is because a growing number of resource deposits are being found in areas with difficult geological and climatic conditions. The pipes and connections employed must therefore have sufficient deformation and load-bearing reserves to withstand these stresses.

LiSA puts the pressure on

So that tests can be carried out in this challenging area, the test facility LiSA (Limit State Analyzer) went into operation at the end of 2011. The purpose of testing is to realistically simulate the load-bearing behavior of a laid pipeline exposed to earth movement. "Our LiSA is a real powerhouse," says Höhler referring to the technical data. "We can realistically subject large-diameter pipes up to 56 inch/1,422 mm diameter to bending tests with and without internal

pressure." Bending is performed in a 4-point bending test with a maximum pipe length of 15.5 m. Via the two load application points each with two 2.5 MN test cylinders, a total bending force of 10 MN can be applied. "This is equivalent to the pressure from five 200 t giant excavators, all standing on the pipeline at the same time."

Test capacity is sufficient for testing a multitude of load combinations. For example, super-high-strength pipes of grade X100 steel with wall thicknesses up to 25 mm can be readily bent and tested to specification.

Destructive but instructive

"The goal is to identify the chief failure mechanisms," says engineer Susanne Höhler. What sounds so tame in theory means almost always for the tester in practice: Apply plenty of tension or compression to the pipe and let it rip. "Hardly any component survives our testing unscathed – without this destructive method there are no instructive findings," she adds.

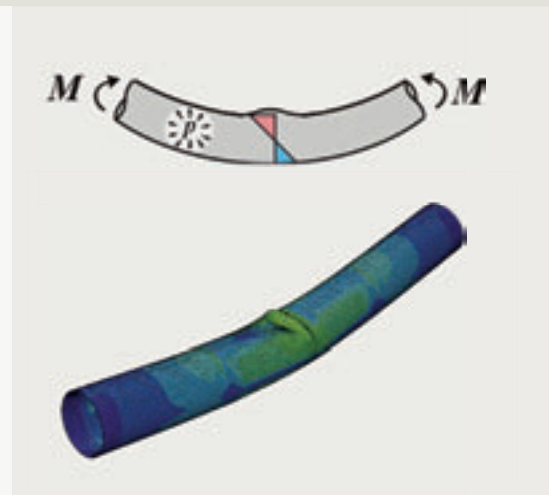
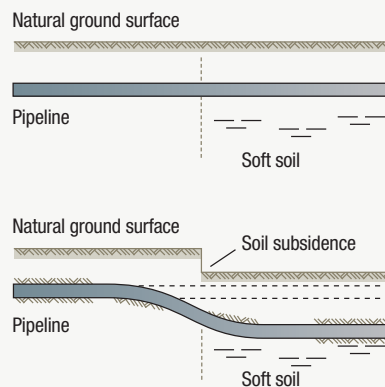
Practical benefits

The results and the findings derived from them are many and varied and always target specific practical benefits. "Our test and research results benefit production in the short, medium and long term and our newly developed products and systems benefit the Group companies," Höhler reports.

Like at Salzgitter Mannesmann Line Pipe: In mutual cooperation, the Component Safety department has been systematically investigating the multi-axial load-bearing behavior of HFI-welded steel pipes since the end of 2011. "We take account of the behavior of both the material and the component. This has meanwhile given rise to very definite product improvements in terms of the required application-related pipe properties."

Specific customer benefits

Dr. Hendrik Lötbe, head of Quality at the Hamm location of Salzgitter Mannesmann Line Pipe: "Thanks to research & development, we can supply our



customers today with line pipe that often more than satisfies the constantly growing aspirations concerning material and component properties. In addition to conventional design criteria, we can therefore supply our customers with extensive further safety analyses."

Research into steel

In-depth research is still being conducted into the material steel even after 75 years. Here, again, Salzgitter Mannesmann Line Pipe benefits. Whenever, for example, the development of new grades of steel for challenging customer projects is concerned, the Materials Development department at Salzgitter Mannesmann Forschung GmbH is often involved. Löbke: "We profit here from a lively exchange of information. If necessary, we all get round the table – those from steel making and rolling, we from the pipe manufacturer, the downstream processors and, of course, the staff from research & development."

The customer comes first

The findings often result in new products and applications like that of HFI-welded steel tubes in the foundation structures of offshore wind turbines. "For us the customer always comes first. Research & development ultimately make products safer and often more economic, and they pave the way to new applications and innovative products," says Löbke. "We're glad to be able to work together in this area with such a competent partner."

Multi-axial load-bearing behavior

Pipelines are primarily designed for resistance to internal pressure from the transported medium. In addition to the internal pressure, external stresses can act on a pipe string, resulting in a combined multi-axial load condition. On the LiSA testing facility, buckling conditions in the compression zone and tensile failure in the tension zone are analyzed under bending stresses or in a pipe bend.

Left: LiSA test setup for pipe deformation by simulated soil displacement, followed by FEM analysis.



Salzgitter Mannesmann Forschung

Salzgitter Mannesmann Forschung GmbH is the central research company of the Salzgitter Group. Employing about 300 members of staff active in eight main departments at the Salzgitter and Duisburg locations, SZMF conducts extensive, in-depth research and development work revolving around the material steel.

R&D activities concentrate mainly on the following key areas

- The development of new materials and application areas
- Processes for the manufacture, processing and application of metallic materials
- Material and component characterization including testing techniques
- Application technology from component design through to metal forming and on to joining technology
- Surface technology with refining systems and their characteristics from visual aspects through to corrosion resistance

- Automation and testing techniques, as well as the construction of non-destructive testing facilities

At the Salzgitter location, the research emphasis is on hot-rolled and cold-rolled products, while activities in Duisburg focus more on tubes, sections and heavy plate.

Apart from Salzgitter AG companies, the customer roster includes numerous leading corporations from a wide range of industrial sectors such as the automotive industry, machine building and plant engineering, as well as energy engineering and the construction industry.



Hardly any component survives our testing unscathed – without this destructive method there are no instructive findings.

*Dr.-Ing. Susanne Höhler,
Salzgitter Mannesmann
Forschung GmbH*



Valentina Berger
Head of Technical Customer Advice in Siegen
Valentina Berger studied Mechanical Engineering at the University of Siegen. She joined Technical Customer Advice at Salzgitter Mannesmann Line Pipe in 2010 and has been in charge at the Siegen location since 2012.

» *In 2010, I was given the chance to move to Technical Customer Advice. For me, this is the ideal combination of technology and dealing with people.*

Valentina Berger



Interview

Teamwork for innovation

Traditionally, men tend to be overrepresented in companies in the steel sector. In response, Salzgitter Mannesmann Line Pipe has had a strong commitment to skilled and hardworking female employees for many years. We asked Valentina Berger and Nadia Schyma to explain how women can assert themselves successfully in the company.

Women and steel – where's the common denominator?

Nadia Schyma: Steel is very versatile – just like women. So they go together perfectly.

Valentina Berger: The steel sector is no longer a purely male preserve. In many areas, it's a question of brainpower, with the focus on quality planning, process control, and continuous improvement and innovation processes. To be good here you need the right skills, regardless of gender.

What do you find fascinating about your positions?

Berger: I can put my technical knowledge into practice every day and broaden my horizons. My duties are very varied, including everything from the processing of technical specifications, and customer and site visits through to participation in current R&D projects.

Schyma: I'm fascinated by the diversity of the people I meet as a result of the company's international outlook. Each project

has its own demands, and this makes work really exciting.

Innovation has a tradition at Salzgitter Mannesmann Line Pipe. What are the strengths of the company that you benefit from most?

Schyma: First and foremost, there's our manufacturing expertise and constant improvements in this area. In project business, responding closely to customer needs is of course very important.

Only if you know the customer do you know where to improve.

Berger: In Technical Customer Advice, we benefit most by working really closely with our customers. This way we can respond to requests early on and offer our customers product and service packages tailored perfectly to their needs.

In what contexts do you produce your most innovative work?

Berger: I prefer working in really mixed teams. I work best together with customers and with experienced and young employees. The customer defines his needs, while young employees contribute new ideas and their older colleagues contribute their wealth of experience.

Schyma: A strong and dependable team is all-important in project business. Only when all areas pull together can the best results be achieved for the customer.

What support do you get from the company so that you can fully exploit your potential in terms of performance and ideas?

Schyma: With the company's actively supported ideas management and with the freedom to act and work on our own initia-

tive. Salzgitter Mannesmann Line Pipe is a very attractive employer that invests heavily in the further training of its manpower.

Berger: By participating in a wide range of workshops, even Group-wide, we're given the chance to contribute in many areas. In the event of interest and the required competencies, it's then possible to be entrusted with the technical management of R&D projects.

What was for you personally the biggest innovation since working for the company?

Schyma: Employee performance and initiative are more strongly encouraged and rewarded. The entire company has come a long way, and production has constantly improved and has become faster. We can now offer our customers timing and solutions that wouldn't have been possible only a few years back.

Berger: The introduction of the Zap-Lok® connection with all its special machining steps. I was there from the very first tests. It's great to see how we realize complex projects with elaborate coatings.

Ms. Schyma, you're a mother of a

school-age daughter. And Ms. Berger, you had your first baby in 2012. How do you reconcile your family needs with the demands of your jobs?

Berger: My position, which frequently involves business trips and visits to customers at short notice, calls for flexibility from both sides. The offers of part-time and home office work are very helpful. But for my part, I have to be flexible when it comes to organizing childcare.

Schyma: Organization and time management are so important! I've built up an efficient network of parents, childminder and friends, and the school offers a very good student supervision system. I keep myself fit for the demands of work and family with regular sports.

What do you see as the biggest challenges for the future?

Berger: We have to tap the full potential of CIP, TPM and lean management so that we can convert them into innovative products and services for our customers.

Schyma: We have to meet the challenges of the markets, constantly improve our technical and organizational processes and build further on our competitive edge.

>>> I found project business exciting and challenging from the beginning. Today I work as the Area Sales Manager for the Middle East, Libya and Egypt.

Nadia Schyma

**Nadia Schyma
Area Sales Manager**

Nadia Schyma started working for Salzgitter Mannesmann Line Pipe in Internal Domestic Sales in 2001 and stayed with this department until 2006. During this time, she studied alongside her work to become a state-examined Business Economist majoring in Distribution Management. Nadia Schyma has been working as District Sales Manager for the Middle East, Libya and Egypt since 2012.





Customer Conference Offshore Day 2014

Sea what the future holds

During its Customer Conference, Salzgitter Mannesmann Line Pipe wanted to give participants an overview of current offshore developments and trends beyond the bounds of the company. The outcome was an interesting exchange of knowledge and ideas between partners, suppliers and customers.



In his talk, David Whittle (Swagelining) focused on the revolutionary LinerBridge®, a novel pipe connection.



Left: Benjamin Chapman (NOV-Tuboscope) spoke about the Zap-Lok system.
Top: The talk was followed by a detailed practical demonstration of the system.

Even before the conference started, it was clear from the speakers list that this would be an interesting and exciting event. The 44 participants from seven countries, who met in Siegen on September 19, 2014, played their part in making the conference a success. Besides employees from pipe-laying and processing companies, representatives from international energy Groups, such as SHELL, were present.

"Instead of emphasizing our own services and performance, we wanted to hear what our project and cooperation partners had to say," says Nils Schmidt, who planned and organized the event. "Strictly speaking, what we had in mind was a technical exchange on existing possibilities and future developments. The focus of the event was on the network of partners and suppliers, and the associated added value for our customers."

Fascinating lecture program

In their talks, all the speakers had the

opportunity to present their respective companies and their key activities.

The speaker from Conline spoke primarily about cooperation between Salzgitter Mannesmann Line Pipe and the Dutch specialist for heavy concrete coats for steel pipes as well as the resultant synergies and customer benefits.

Swagelining from Scotland is concerned with polymer liners and innovative pipe connections. David Whittle focused on the revolutionary LinerBridge® Connection. In contrast to conventional techniques – which are either quick and expensive or more favorably priced and slow – and the product developments of many other pipe-laying companies, this novel connection represents a quick, cost-effective and flexible solution.

Elke Muthmann from sister company Salzgitter Mannesmann Grobblech gave a complete overview of her company's portfolio and highlighted special features of successfully realized offshore projects.

Benjamin Chapman from NOV-Tubo-

scope explained the Zap-Lok connection process and talked about the first off-shore projects to use this novel system. According to a 2013/2014 study, the pipe-laying company proved that Zap-Lok is on a par with conventional welded joints in the offshore sector. The talk was followed by a detailed practical demonstration of the process during a guided tour of the Siegen plant.

Event concept worked well

All participants followed the program with great interest. There were lively conversations after the talks and, during the breaks, news was exchanged and trends were discussed.

David Whittle from Swagelining: "A well-planned event that has given us new and promising insights into technically related areas."

The basic idea of promoting an exchange and know-how transfer between the organizer, partners, suppliers and customers proved to be a genuine success.



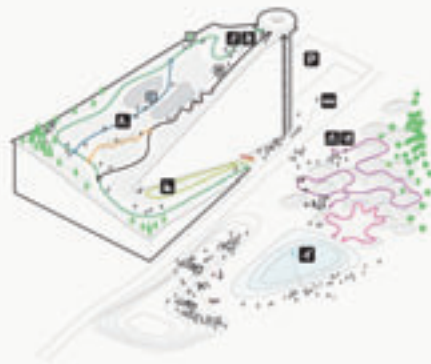
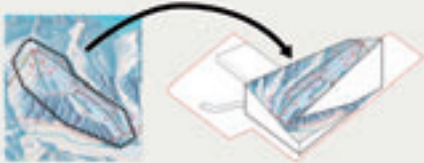
Elke Muthmann's presentation also highlighted numerous offshore projects successfully realized by Salzgitter Mannesmann Grobblech.



Project Copenhagen waste-to-energy plant

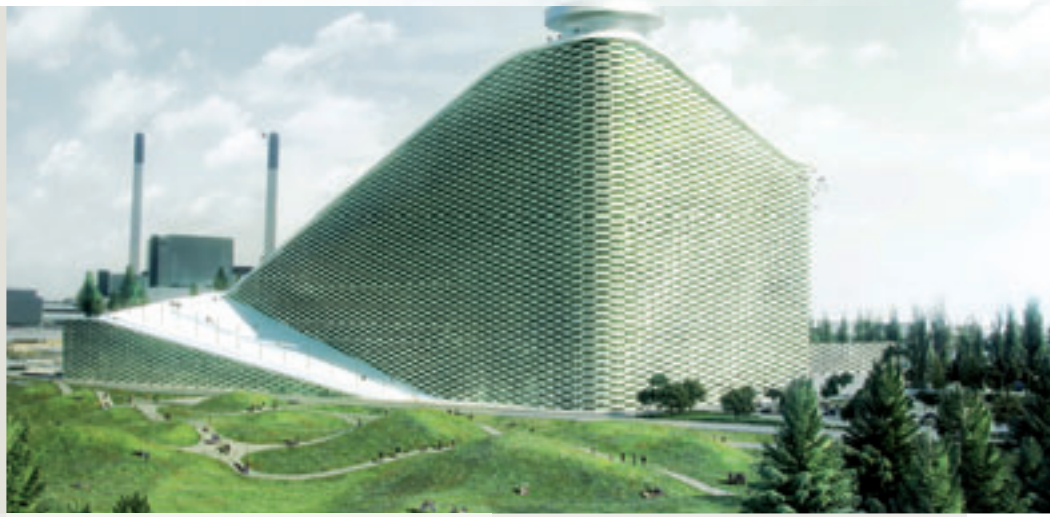
Downhill downtown

What is probably the world's most innovative waste incineration plant is currently under construction only three kilometers from Copenhagen's city center. It will be a landmark, ski slope, energy supplier and carbon emissions monument all in one – with steel tubes and MSH sections from Salzgitter Mannesmann Line Pipe.



Left: Downhill downtown – Alpine skiing comes to the city.

Right: Industrial facility and leisure center complement each other in a totally new way.



In 2010, Copenhagen's energy supplier ARC organized a competitive bidding procedure for a new waste-to-energy plant. Packed with the very latest equipment for efficient district heat production, the new facility is scheduled to replace the 40-year-old neighboring plant. The key targets are 25 % higher energy yield, slashed NO_x output and several 100,000 metric tons less carbon emissions per year. "Amager Bakke" will be the biggest and most advanced plant of its kind in Denmark. Costing roughly EUR 500 million in total, it is due to go into operation in 2017.

Unanimous verdict for extraordinary project

In cooperation with Berlin's MAN MADE LAND and realities:united, Danish architects Bjarne Ingels Group, or BIG for short, were awarded the contract. The client and jury were unanimously impressed by the design. The plans of the meanwhile internationally operating rising star on the international

architecture scene explode the concept of conventional building design. BIG have subjected the notions of building, technology, topography, urban planning, multifunctional use and the public debate on climate policy and carbon emissions to a complete rethink. And the outcome is as multifaceted as the analysis is thorough. The finished complex will be an all-in-one waste incinerator, energy plant, building, sculpture, ski slope, landscape, landmark and monument.

High-tech facility and monument

With a height of 100 meters, the new building will be one of Copenhagen's tallest and a new landmark. A panorama restaurant will offer patrons a magnificent

360° view of the Danish capital, the port district and the Öresund strait.

The roughly 31,000 m² roof will serve as ski and snowboard slopes of varying degrees of difficulty and, with about 1,500 m of downhill pistes, will be a genuine alternative to the nearest ski resorts several hours' car ride away in southern Sweden. Nor will its use be short-lived, as Copenhagen has a roughly four-month night frost period each year.

From a distance, the greened façade will resemble a monolithic, moss-clad rocky ramp. The new waste incinerator will be embedded in a newly created, roughly 16 ha park close to the city center that



We ask how sustainability can improve quality of life and be fun.

Bjarke Ingels, architect



The new power plant will be part of a roughly 16 ha industrial, sports and leisure zone.



Left: The CO₂ rings will make carbon emissions visible from a distance.

will offer numerous and wide-ranging leisure opportunities. The outcome will be an energy plant and a leisure facility in a new, unique combination.

Visible monument to an abstract debate

BIG brings the causers of waste to the (provisionally) ultimate destination of their consumer waste. Instead of a conventional lift for skiers, there will be glass elevators in the interior of the facility to transport skiers and snowboarders to the summit and give them a view inside the waste incineration plant.

And that's not all. As a feature visible from all over Copenhagen, the facility will puff artificially generated smoke rings into the sky. Each ring will be about 30 m in diameter and 6 m in height and emit half a ton of CO₂ into the atmosphere. As the rings gradually rise and cool, the water within the gas cloud will condense and make it visible shortly after leaving the facility. This will be the

first time that otherwise invisible and abstract CO₂ emissions will be made visible to all and sundry. The strategy lends form and magnitude to the abstract debate on emissions and thus creates a new angle on the social and political treatment of the subject of resources and climate change.

800 t of steel tubes and MSH sections

The elaborate construction project kicked off in 2013 and will continue until 2017. For the load-bearing piste structure of the roughly 31,000 m² sloping roof, Salzgitter Mannesmann Line Pipe supplied roughly 800 tons of HFI-welded steel tubes and MSH sections through Salzgitter Mannesmann Handel GmbH to Züblin Stahlbau GmbH. The company domiciled south of Berlin was in charge, among other things, of execution planning and of the production and assembly of the building's heavy steel structure, prestressed concrete hollow elements, reinforced concrete wall elements and sandwich

walls with a fire protection rating as well as the waterproofing and drainage of the roof structure and the supply and assembly of the chimney.

One-off production

"We're of course proud to be participating in such an innovative and exceptional project," says Guido Ludwig, involved in handling for Salzgitter Mannesmann Line Pipe through Salzgitter Mannesmann Handel GmbH in Düsseldorf. The extensive and complex construction project demanded a huge number of different lengths, wall thicknesses and diameters of tubes and MSH sections. "So that we could plan and organize the project better, we divided it into 20 different jobs. Of the total of 711 tubes, numerous sizes were supplied as one-offs," Ludwig recalls. The Siegen and Hamm locations produced tubes in diameters of 219 to 610 mm, wall thicknesses up to 25 mm and lengths up to 18 m. "The huge variation in the sizes



Left: Start of foundation work for the new facility that, with a height of 100 m, is set to be a new Copenhagen landmark.

Right: Visualization of the interior. Creating transparency, galleries will offer intriguing vistas inside the facility.



and batch sizes made this order a really demanding project in terms of production planning, delivery and logistics, and called for a good deal of flexibility from everyone concerned," Ludwig continues.

Mathias Berger, responsible product manager at Salzgitter Mannesmann Stahlhandel, tells the same tale: "Orders placed at short notice and changes in dimensions, lengths and delivery dates are the order of the day and have been a major challenge for us. But we're equipped to deal with them."

In addition to tubes and MSH sections, flame-cuts of heavy plate from Ilsenburg were also supplied to the project via Salzgitter Mannesmann Stahlhandel. Good communication between the Salzgitter Group companies has been a key factor throughout. "We can rely on each other at all times," says Berger. He, too, is really enthusiastic about the construction project and the architecture. "It's the combination of functionalism and leisure use that makes the project so spectacular."

Yes is more – BIG, Bjarke Ingels Group

Bjarke Ingels came to architecture by a roundabout route – actually, he wanted to become a comic artist. And maybe it is this interest that explains the boldness of his striking and thoroughly life-affirming designs. What is probably the world's most innovative waste incinerator is currently under construction in Copenhagen – with a ski slope on the roof and smoke rings rendering CO₂ emissions visible.

Bjarke Ingels, born in 1974, studied architecture in Copenhagen and Barcelona, gaining his degree in 1998. From 1998 to 2001, he worked at Rem Koolhaas' OMA in Rotterdam. In 2001, he and Julien de Smedt founded PLOT Architects, which attracted international attention right from its early stages. In 2004, PLOT was awarded the Golden Lion at the Architecture Biennial in Venice for the design of a concert hall in Stavanger, Norway, and, in 2005, the firm won its first big competition.

In 2006, Ingels then set up BIG, the Bjarke Ingels Group. Numerous international competition entries and prizes have since been alternating with prestigious awards. The Copenhagen firm now also has branches in New York and Beijing for the realization of specific local projects. In 2009, Ingels published his architecture comic "Yes is more – an archicomic on architectural evolution" for the BIG exhibition of the same name at the Danish Architectural Centre in Copenhagen.



Left: Construction work on the roughly EUR 500 million project is scheduled for completion by 2017. Center: State of progress in May 2015. The steel structure for the 31,000 m² roof is gradually taking shape.

New gas storage facility ensures ongoing supply security

About 88 % of the natural gas consumed in Germany is imported. To ensure reliable supplies, a large number of underground gas storage systems are operated across Germany. As of 2017, a new facility using steel pipes from Salzgitter Mannesmann Großrohr will provide additional supply security.

The classic task of underground gas storage systems is to compensate for seasonal and daily demand peaks. As with mineral oil, this buffer function is being increasingly backed up by strategic storage for times of crisis.

Storage systems could, however, be employed for a further purpose in future, namely for the storage of synthetic natural gas obtained from excess wind and solar power.

Synthetic natural gas from electricity

While we are familiar with the use of natural gas to generate electricity, the reverse process may well be conceivable. For in 2010, German researchers succeeded in storing electricity as natural gas. The new process for the production of synthetic natural gas combines the technologies of hydrogen electrolysis and methanization for the first time. When hydrogen reacts with carbon dioxide, the result is methane, which is basically natural gas, albeit produced synthetically.

The ideal storage facility for excess wind and solar power

In their joint research, the scientists of the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) and the Fraunhofer Institute for Wind Energy and Energy System Technology (IWES) were guided by two central questions. Firstly: Which storage method offers sufficient capacity for the varying volumes of renewable energies? And secondly: Which storage facilities can be most easily integrated into the existing infrastructure?

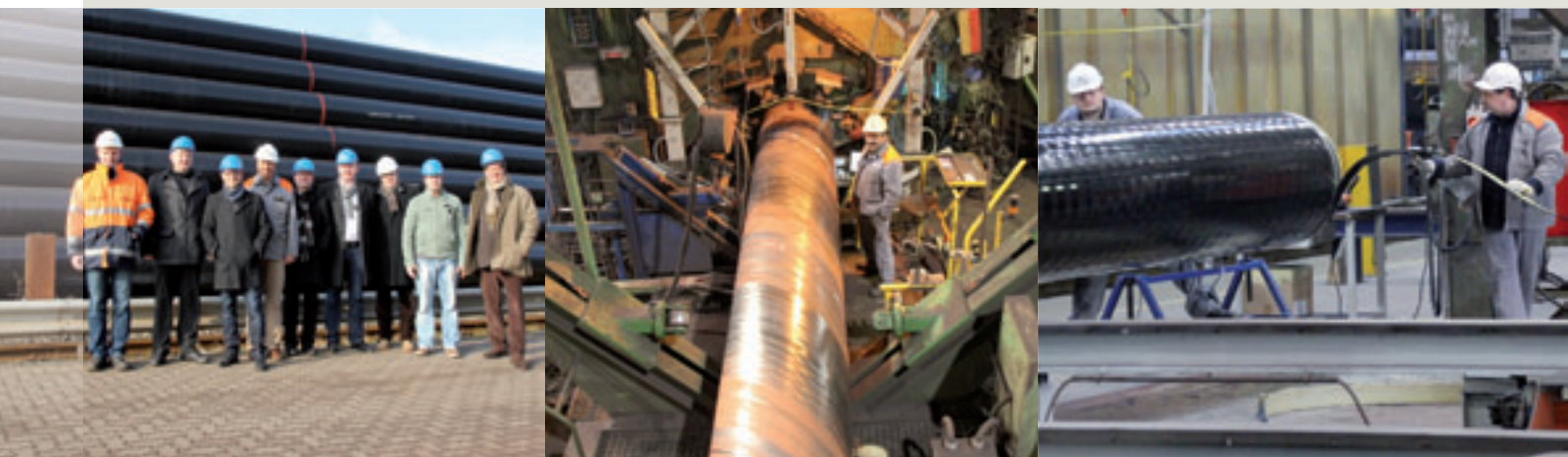
The answer was the same in both cases: The storage reservoir of the German natural gas grid with approximately 50 locations and more than 240 individual storage facilities. The grid's storage capacity currently amounts to over 200 terawatt-hours, corresponding to the consumption of several months. By comparison, the electricity grid merely has a minimum buffer of 0.04 terawatt-hours, derived chiefly from pumped-storage hydroelectric plants.

Bottom left: Customer visit to Salzgitter Mannesmann Großrohr from ThyssenKrupp Schulte Leipzig with EPG, VNG and ONTRAS on February 5 and 6, 2015.

Center: 2,127 pipes were welded within 11 weeks.

Right: The pipes were then given an epoxy lining and a 3-layer polyethylene coating.

Page 25: The pipes were delivered to two storage yards. There they were stacked to customer specifications and linked with GPS data.



Construction work on the technical installations, the energy supply building and the compressor hall started in the autumn of 2014.



Picture ©Gazprom Germania

Additional storage capacities

In 2011, Erdgasspeicher Peissen GmbH started building the underground gas storage facility "Katharina". Over the next 15 years, a total of 12 caverns with a working gas volume of approximately 600 million cubic meters will be created in rock salt deposits in Saxony Anhalt. This corresponds to an energy volume of 6.52 billion kilowatt-hours, which would cover the natural gas demand of 300,000 households for a whole year. The caverns will be drilled and leached at depths of 500 to 700 m.

Connection to JAGAL

In addition to the underground caverns, a feed and withdrawal plant and a compressor hall are being built above ground to allow the new storage facility to be connected to the trans-European pipeline grid. In addition, starting in spring this year, a 37 km long connecting pipe is being laid to the JAGAL pipeline which runs east of Katharina.

Increased technical demands on line pipe

Salzgitter Mannesmann Großrohr's long years of experience in meeting the most exacting technical requirements earned it the contract for the supply of the DN 800 spiral-weld pipes needed for the project. Besides steel grade L525ME, DWTT: -20 °C, the customer had specified extremely tight tolerances regarding the outside diameter and roundness. For example, the weld reinforcement was not to exceed 0.8 mm.

Meeting these stringent specifications was only possible thanks to the excellent coordination between the quality teams of Salzgitter Mannesmann Großrohr and Salzgitter Flachstahl. For several months, they worked out technical ways and means of meeting the high demands. Eventually, when all the procedures had been harmonized with the technical specifications, the hot wide strip was rolled at Salzgitter Flachstahl in four sequences between October and December 2014. The pipes were then manufactured between mid-November 2014 and February 2015 and delivered by truck. Per journey, four to five pipes were transported over 140 km from the Salzgitter pipe mill to two storage yards in the Köthen area. There the pipes were unloaded with a crawler-mounted vacuum lifter, stacked to customer specifications, scanned and linked to GPS coordinates.

Commissioning and start-up in 2017

Construction of the above-ground facilities and the connecting pipe is scheduled for completion by 2017. By then, the number of caverns will have risen to seven, which means the maximum withdrawal potential of about 24 million cubic meters/day will have been reached – another milestone on the way to ensuring supply security for Germany. The last of the planned caverns will then be available in 2024 – maybe for synthetic natural gas from renewable energies, who knows.



Katharina underground gas storage facility

The Katharina UGS facility near Bernburg is being built by a Joint Venture of Gazprom Export and Verbundnetz Gas – Erdgasspeicher Peissen GmbH. Its purpose is to bolster reliable gas supplies to Western Europe, including supplies via the Nord Stream pipeline.

UGS Katharina storage capacity

Working gas volume:

approx. 605 million cubic meters

Feed capacity:

max. 12.0 million cubic meters/day

Withdrawal capacity:

max. 24.0 million cubic meters/day

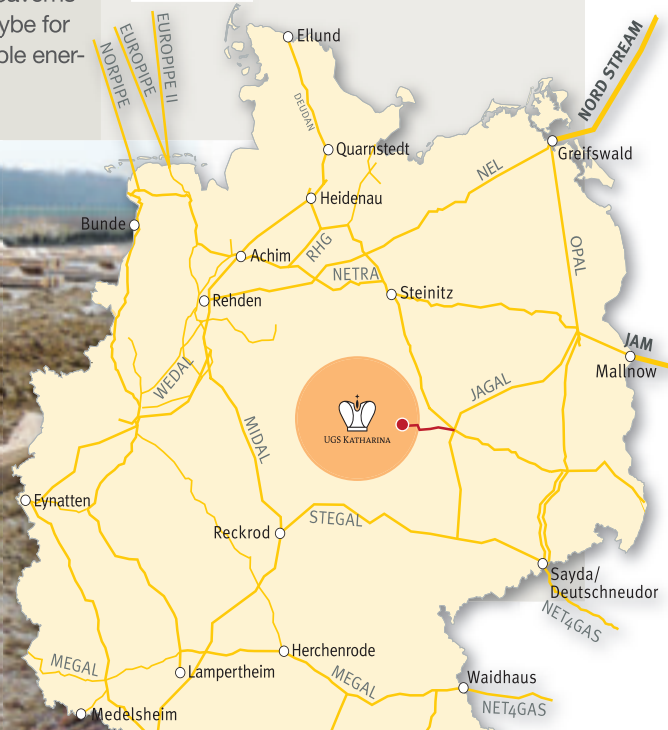
Natural gas storage in Germany

The possible methods include pore storage (in former oil or gas reservoirs or aquifers) and storage in salt caverns. Germany's first underground gas storage facility – the Engelbostel aquifer – was commissioned in 1955. It was abandoned for economic reasons in the late 1990s.

www.magazin.smlp.eu/en/katharina



More photos on this project can be found in our new web magazine.





The clearcoated line pipes from Salzgitter Mannesmann Line Pipe have become the characteristic design feature.

Project Vienna Technical Museum

Channeling the visitor's gaze

Mineral oil and natural gas play an important part in almost all aspects of life – reason enough for Vienna Technical Museum to dedicate exhibition space to this subject. On show are HFI-welded steel pipes from Salzgitter Mannesmann Line Pipe – not for transporting resources, but for channeling the visitor's gaze.

Left: Even during the opening, the new exhibition encouraged visitors to actively participate.

Right: Exciting and interactive exhibits make the show eventful and graspable.





As the starting material for plastics, fertilizers and pharmaceuticals, for heating or for the generation of power, mineral oil and natural gas are part and parcel of modern life. Our transport systems, be they on water, overland or in the air, depend almost entirely on these fossil fuels. At the same time, mineral oil is also one of the world's most controversial resources – from the environmental, economic and political points of view.

Partner wanted for prestigious project

At the beginning of July 2014, Vienna Technical Museum started looking for pipes for the newly planned exhibition devoted to mineral oil and natural gas. "We at Salzgitter Mannesmann Line Pipe knew immediately that we wanted to be the partner for this prestigious project and contribute to the success of the exhibition," explains Thorsten Schmidt, co-responsible for the project at Salzgitter Mannesmann Line Pipe. "Together with Austrian elbow manufacturer Erne Fittings, we supplied pipes and elbows free of charge," he adds, continuing: "For this project, we were also faced with a deadline that was almost impossible to meet." Because there was only little time left until the opening of the exhibition on October 10, 2014.

During a visit on site arranged at short notice, they decided together with the exhibition organizers to coat the pipes with clearcoat so that they wouldn't lose their

characteristic steel appearance. And this increased the deadline pressure still further.

"Our coating facilities are of course not at all suitable for handling such minute quantities," says Schmidt. "The exhibits were processed almost entirely by hand, so they literally passed through several hands. In the exhibition, it was immediately obvious that the effort and elaborate manual labor had been worth it," says Schmidt, who, along with others involved in the project, attended the official opening of the exhibition in October 2014.

Tangible and accessible exhibition

On the basis of six selected sample locations, the roughly 250 m² exhibition space belonging to the permanent "Energy" exhibition shows the interplay between mineral oil, natural gas, mankind, the environment and technology. This exciting world is made tangible and accessible by the exhibition. Standing on-end, the line pipes are not only characteristic design elements, but also "graspable" objects that channel the visitor's gaze. A double floor allows visitors to look below ground – inspection windows remind them that the production, transport and processing of mineral oil and natural gas take place to a large extent underground. The interactive exhibits of the show invite museum-goers to handle crude oils and give them a personal feel for the subject-matter.

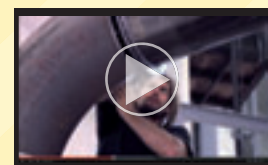
The model truck inserted into the pipe illustrates how many truck journeys by road would be necessary to equal the capacity of a pipeline.



Vienna Technical Museum

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www.technischesmuseum.at

www.magazin.smlp.eu/en/vtm



Watch the exciting time-lapse film showing exhibition set-up and providing supplementary information on our website.



Project Ashburton Onslow Gas Pipeline, Western Australia

By land, sea and air

Salzgitter Mannesmann Line Pipe has supplied HFI-welded steel pipes to Australia for the first time. The Ashburton Onslow Gas Pipeline serves a power plant that generates power for a mining area. Despite the haste and the distance, pipe-laying got underway on schedule – thanks to deliveries by land, sea and air.



In the course of production in Siegen, Valentina Berger, TKB, explains the current test results to Tomoya Mihara (Mitsubishi Australia), Nghia Truong (DBP) and Sha Alavi (Metal One UK).



In 2013, a Japanese international trading house (Metal One) with a branch in London inquired about steel pipes for a natural gas pipeline in Australia. "Initially it sounded like a big challenge," Nils Schmidt, responsible Area Sales Manager at Salzgitter Mannesmann Line Pipe, recalls. "After all, the contract also called for pipe bends – a possible job for our sister company Salzgitter Mannesmann Grobblech."

The first bid at the end of 2013 then became known internally as the "Ashburton Onslow Gas Pipeline Project" at the beginning of 2014, with a definite order being placed in July. The problem was that the pipes and pipe bends had to be ready at a storage yard near Onslow in Western Australia by September – some 13,000 km as the crow flies from the Siegen and Mülheim production sites.

So everything had to shift into gear quickly. Together with customer representatives and project coordinators, a team was put together for implementation. After clarification of the technical specifications, an audit was held at

short notice in Siegen and Hamm for the pending project in February 2014.

Nils Schmidt: "The biggest stumbling block for us was not the technical specifications but the tight production and delivery deadlines." Pipe production was launched immediately after order receipt while the Logistics department attended to the timing of delivery and handover to a suitable sea forwarder.

The process was then stalled by problems in strip production, and the prospects of a several-week delay in delivery of the 435 t of X52M pipes loomed. The project team immediately pulled out all the stops in their quest for a swift solution. The customer representatives were therefore more than delighted when they were able to release higher-grade coils obtained at short notice for production. The production of the urgently needed goods was only held up for few days.

To make use of the already tightly scheduled loading window at the Port of Antwerp, the first pipes for container shipment were sent in parallel by rail and truck from Siegen. Here again, Tomoya

Mihara, Sha Alavi, Nghia Truong, Nils Schmidt and a surveyor's agent were available on site so that the urgent freight could be loaded unscathed and expertly into a total of 23 sea containers and dispatched on its long voyage. The consignment went via Singapore to Perth, where the pipes were subsequently sent by truck roughly 1,000 km to the north.

Due to the delay in strip milling and subsequent pipe production, it unfortunately wasn't possible to complete the pipe bends on time – by now shipment by sea was out of the question. An air freight shipment was therefore organized at short notice that took off on a 23-hour flight from Frankfurt to Perth in October. As a result, pipe-laying on the Ashburton Onslow Gas Pipeline still got off to a punctual start.

The close-out meeting was held in Perth in March 2015, with a project review conducted together with DBP and Metal One/Mitsubishi. Nils Schmidt: "The cooperative attitude of everyone concerned and the solution-driven approach made the project a success for all of us."



Far left: Loading the pipes into sea containers at the Port of Antwerp. Center left: Sha Alavi, Nghia Truong and Tomoya Mihara monitoring the loading work. Left: So that the pipes could be loaded on time in Antwerp, they were sent in parallel by rail and truck.

Left: Overdue and yet on time – the pipe bends were sent by air freight. Right: The pipe-laying work some 1,000 km north of Perth started punctually thanks to swift delivery by Salzgitter Mannesmann Line Pipe.





1. Germany Visit to a construction site of Mainz public utilities



1. Germany Guided tour of the Salzgitter Mannesmann Line Pipe works in May 2015 on the occasion of the 20th anniversary of DCA Europe (Drilling Contractors Association)

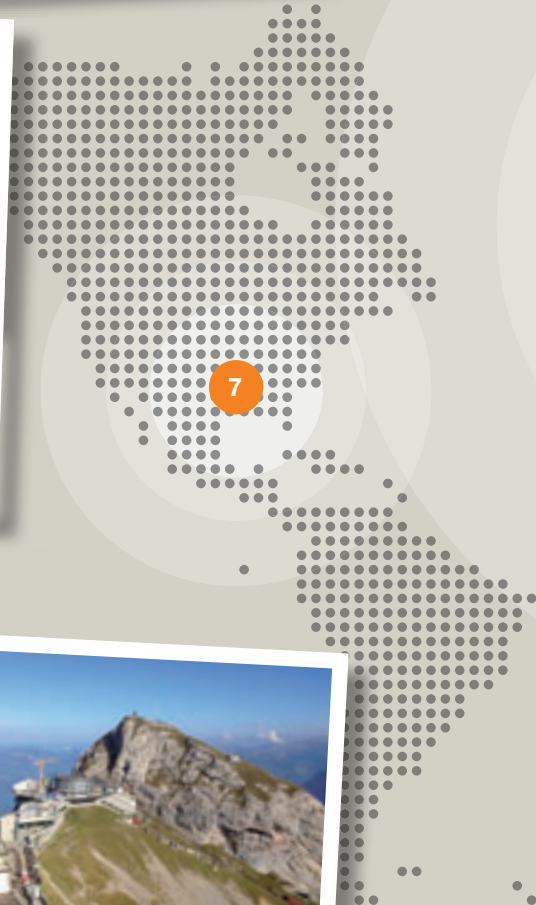


1. Germany Excursion to the Garzweiler II open-cast mine during the 19th DCA Annual Congress in Düsseldorf

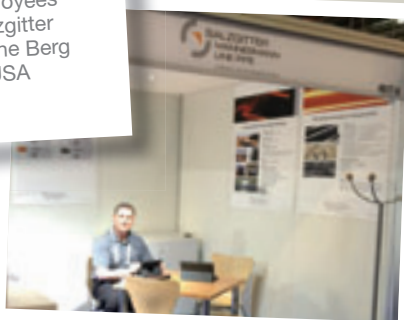


© Wasser-Berlin International

1. Germany WASSER BERLIN INTERNATIONAL 2015 / Opening tour: left to right: Jörn Winkels, Dr. Barbara Hendricks, Federal Minister for the Environment, Nature Conservation and Nuclear Safety, S.E. Dr. Hazim El-Naser, Minister of Water and Irrigation, Jordan



7. USA Sharing ideas: Employees of Berg Spiral Pipe and Salzgitter Mannesmann Großrohr at the Berg Spiral Pipe Mill in Mobile, USA



7. USA Kurt Swendson, Salzgitter Mannesmann International Inc., Houston, at the Offshore Technology Conference in May 2015 in Houston



5. Switzerland 2nd Technical Symposium "Water Supply and Sewage Disposal" on the Pilatus



6. Austria Opening of the permanent exhibition "Oil and Gas" at Vienna Technical Museum

On the go –
from global to local



2. Denmark Trade fair stand at European Wind Energy Association – EWEA OFFSHORE 2015 in Copenhagen



3. Romania Henning Salecker at "SEE Upstream Conference and Exhibition 2015" in Bucharest



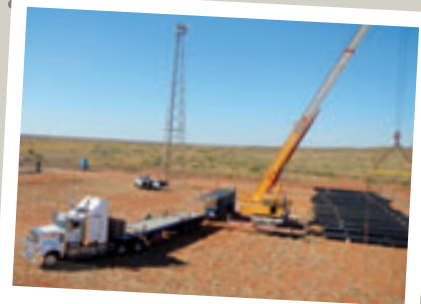
"SEE Upstream Conference and Exhibition 2015" in Bucharest



4. Poland Gas Engineering Trade Fair EXPO-GAS in Kielce. From left: Anna Maciejewska, Karol Szlecht, Tatjana Rosen



9. Kenia Friedemann Dörfer at KPC Pump Station 23 in Naivasha, with David Lenaiyarra and Malei Nthiwa



8. Australia Pipes being stacked on arrival for the Ashburton Onslow Gas Pipeline

Legal notes

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