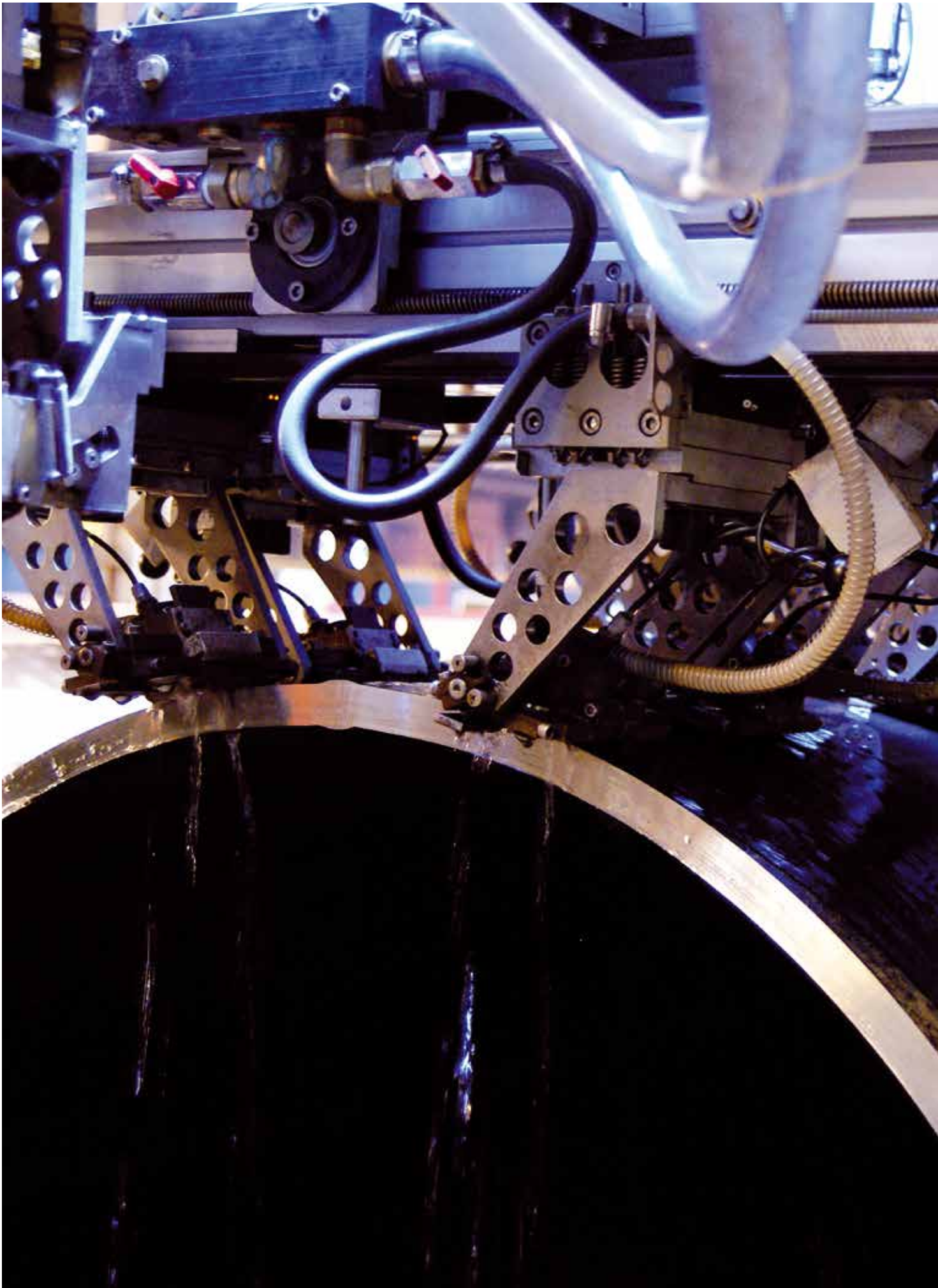




Products for the
Oil and Gas Industry







THINKING AHEAD

1804. The Dillinger Hütte steel mill rolls its first steel plate. In 1845, a company which later became part of Mannesmannröhren-Werke produced continental Europe's first welded steel pipe. In 1991, these two steel industry pioneers – AG der Dillinger Hüttenwerke and Mannesmannröhren-Werke AG – decide to pool their experience and know-how to create EUROPIPE.

Our rich heritage in terms of steel technology and manufacturing expertise, plus the dedication and hard work of our employees, has enabled us to achieve some very demanding objectives.

Today we are the world-market leader in large-diameter pipe production for the oil and gas sector and have the most extensive manufacturing footprint in the industry. With four mills in Europe and the USA, producing annually 3,000 kilometres of large-diameter pipe for pipeline projects throughout the world: onshore and offshore, in the arctic ice, in the depths of the world's oceans and in the desert heat.

Our success is based on a simple principle: thinking ahead. Each and every one of our employees is committed to the philosophy of anticipating customer needs in order to make our products, processes and services even better. The ability to think ahead is the pledge of top performance with which we approach every challenge, and especially when it comes to creating products, the quality of which has determined our market for many years.

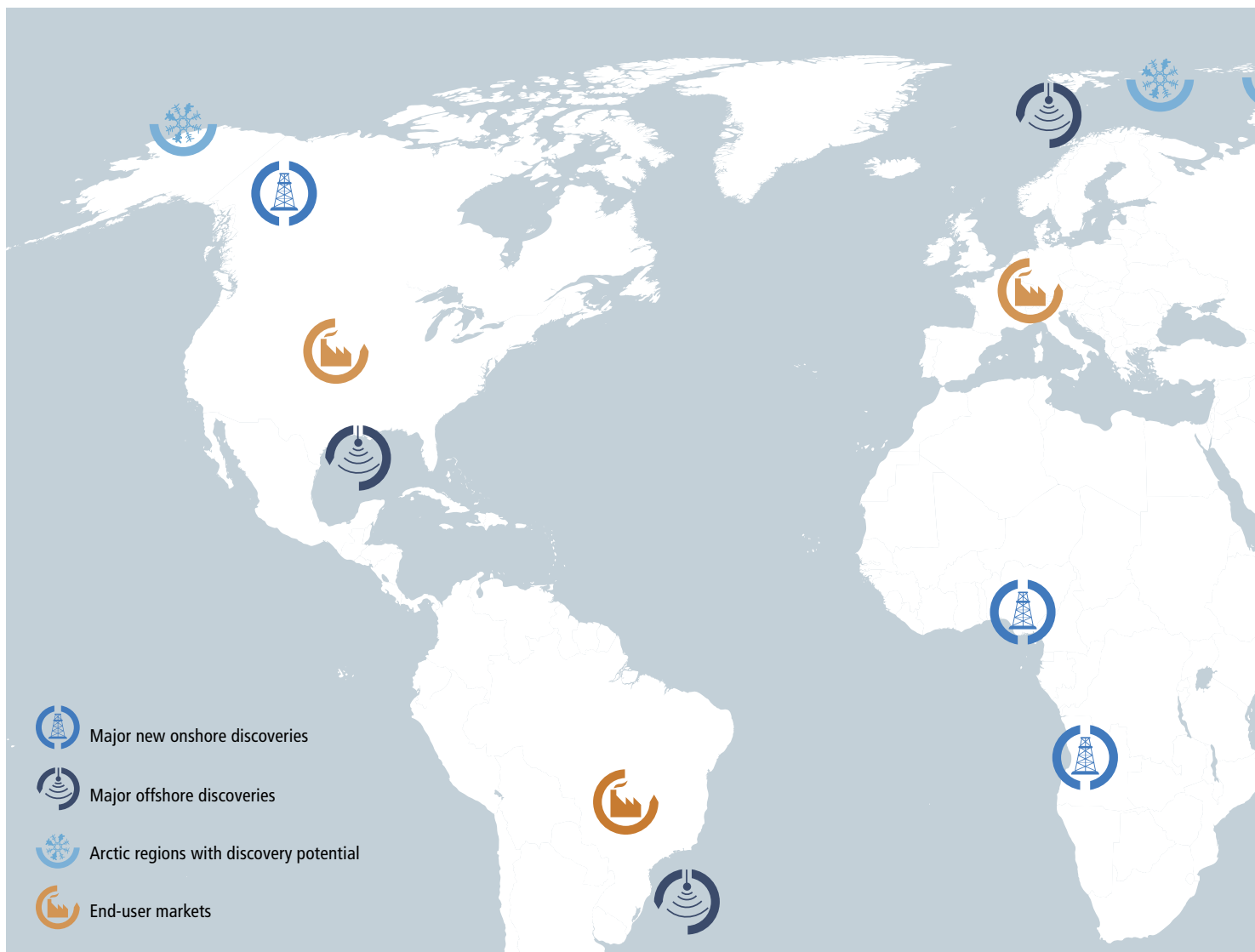
POSITIONED FOR SUCCESS IN THE OIL AND GAS MARKET

The global oil and gas market requirements have changed significantly in the last two decades.

The rise of the multipolar world, technology development in leaps and bounds and significant changes in the energy-mix have had a large impact on all participants in this market. However, one thing has not changed: the need for reliable, technology-driven pipe suppliers focused on the long term. Just like EUROPIPE.

New oil and gas supplies are found at increasingly greater distances from end-user markets.

The Arctic region for example has grown into a significant source of supply, as have offshore developments in continents such as Africa and South America, areas that show a promising future. In addition, many of the global growth regions are far away from existing supply markets and the energy-mix is tilting towards an increased use of natural gas.



Access to and development of new oil and gas fields has become significantly more challenging.

In many of the leading offshore regions such as the Gulf of Mexico, deep and ultra-deep developments account for more than 80% of production. The Arctic region, another example of an area with large potential oil reserves, poses unique challenges for oil and gas field development because of extremely low temperatures.



The specific requirements of hydrocarbon transportation with large-diameter pipes have grown accordingly.

As a result of the increasing distances between supply and end-user markets, pipelines have tended to become longer, with much more stringent demands with regard to environmental and security concerns. This may result in increased operating pressures during transportation.

Due to the remote nature of many of the new supply regions, the environments that new pipelines have to cross are much harsher than in the past. In addition, sour gas is forming an increasing share of transported media.

EUROPIPE has a focused position in the large-diameter pipe manufacturing industry.

The combination of pre-material supply, pipe manufacturing and pipe coating in one integrated group allows for a unique flexibility when reacting to technical challenges. All materials up to and including X100 are proven and have demonstrated their performance capabilities for many years in applications on a worldwide scale.

Because of our strong shareholder structure, we are able to think ahead and plan and invest accordingly in unrivalled timescales, encompassing not merely years but decades.

MULTIPLE STRENGTHS

Our pipes are manufactured in accordance with all relevant national and international standards (API, EN, ISO, ASTM) and specifications (NACE, DNV and others), as well as taking customer specifications into account.

To anticipate and meet the requirements of a constantly evolving large-diameter pipe market, EUROPIPE has extensive research & development activities.

These are integrated into a comprehensive network of established research facilities and benefit from close collaboration with institutions and companies within the large-diameter pipe industry value-chain.

In addition, the integration of the manufacturing process enables unrivalled flexibility in adapting pre-materials, pipe geometry and coating to specific customer requirements.

On the pre-material side, we focus on high-strength and high ductile steel. To achieve both high strength and enhanced toughness, we use steels with particularly fine-grained microstructures, achieved by combining state-of-the-art controlled casting, rolling and cooling technologies and processes.



In the pipe manufacturing stage we focus on forming and welding technology, resulting in improved pipe geometry to facilitate pipe laying. By enhancing our welding technology we have also achieved higher HAZ toughness. Constant investment into state-of-the-art production, welding and quality control infrastructure ensures our ability to meet future requirements in this field.

The coating stage of the value-chain offers opportunities to enhance the properties of the pipes by applying tailored coating parameters, the type of coating applied being dependent on specific customer needs such as rough coating, FBE, PE and PP.



READY FOR THE DEPTHS

As pipelines become longer, many of the routes chosen are based offshore. This environment has very specific requirements, especially regarding the ability of pipes to withstand very high water pressures. Our heavy-walled pipes, with relatively small diameter-to-wall-thickness ratios, have been proven to withstand depths of up to 3,500 metres without buckling.

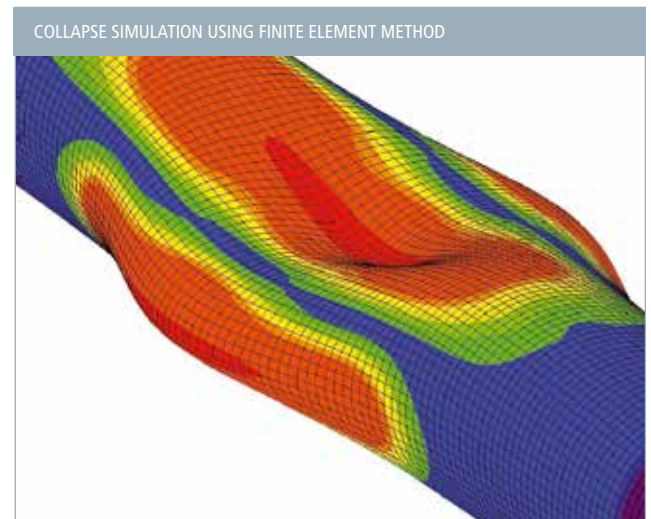
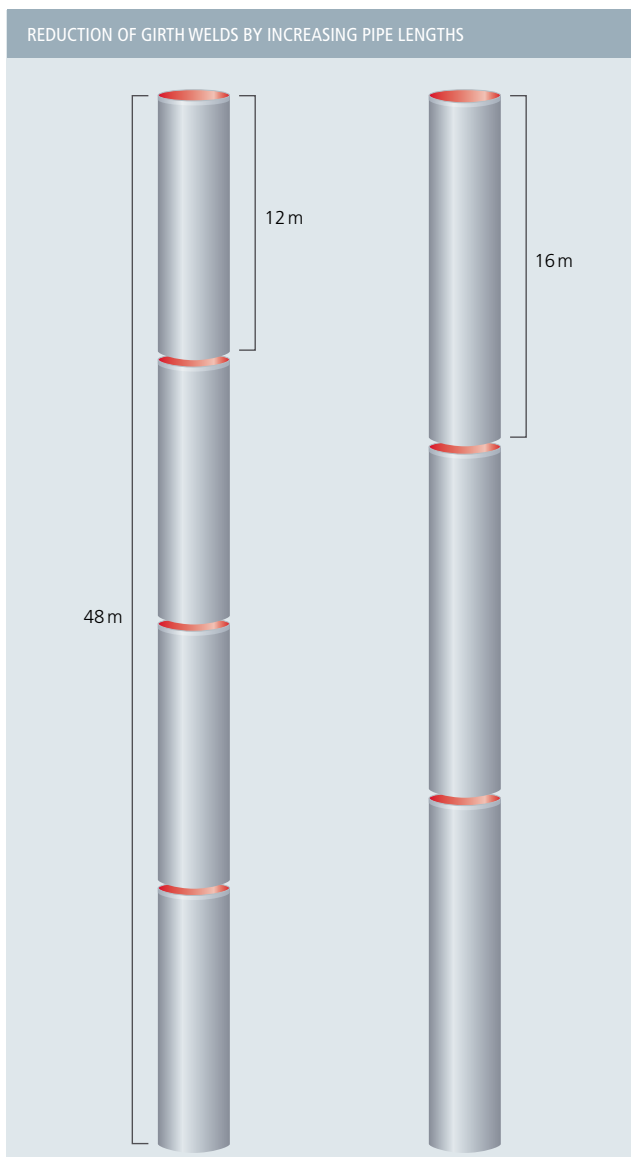
In extensive component tests we have succeeded in quantifying the parameters affecting collapse resistance. As a result, we place stringent demands on pipe geometry and uniformity of mechanical properties. These are achieved by a combination of a fine-tuned pipe-forming process, proprietary tool and machine designs and a workforce that is peerless in its ability to master such processes.



In the coating stage we have ascertained that collapse resistance of a pipe can be significantly improved by heat input during the application of pipe coating.

EUROPIPE has delivered pipes up to 41 mm W.T. (Diameter 24") in grade X70 with high strength and toughness in both base metal and seam.

As well as customary offshore lengths of up to 12.5 m, EUROPIPE offers pipes up to 18.3 m (60 ft) long. These types of pipe have more than 30 % less welds per kilometre of pipe compared to standard lengths, resulting in significant cost savings in terms of both time and material.



SOUR GAS PIPELINES

Sour gas is increasingly being focused upon due to the greater number of newly discovered wells containing natural gas with corrosion promoting ingredients such as H_2S and the economical valorisation of associated gas.

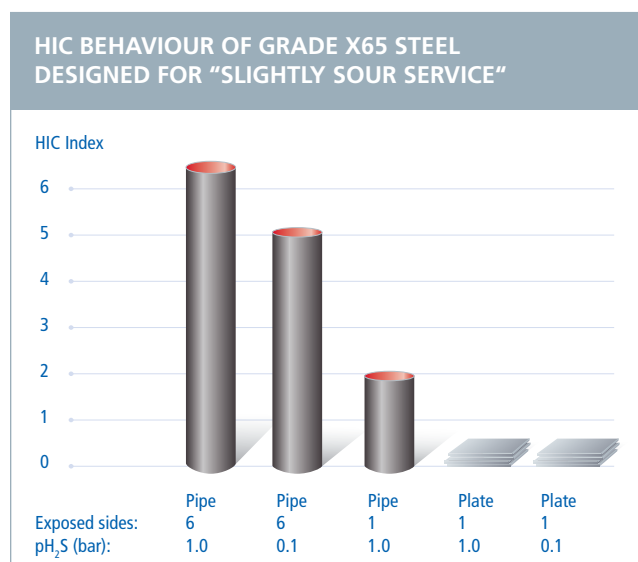
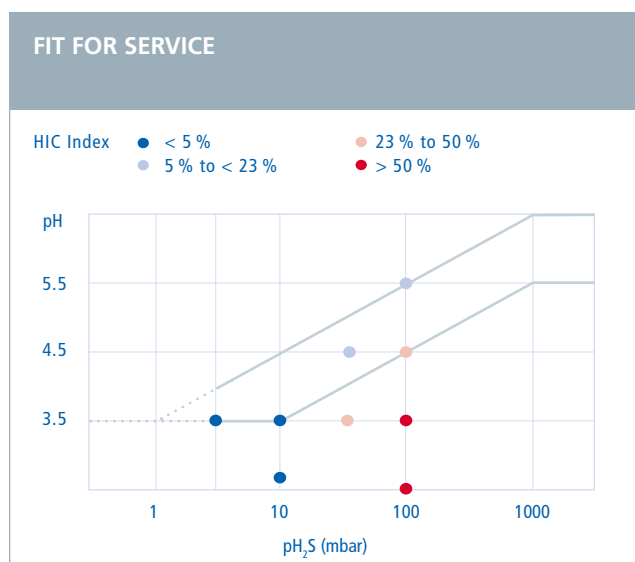
The manufacturing of sour service grades for linepipe with resistance to hydrogen induced cracking (HIC) has a long history at EUROPIPE.

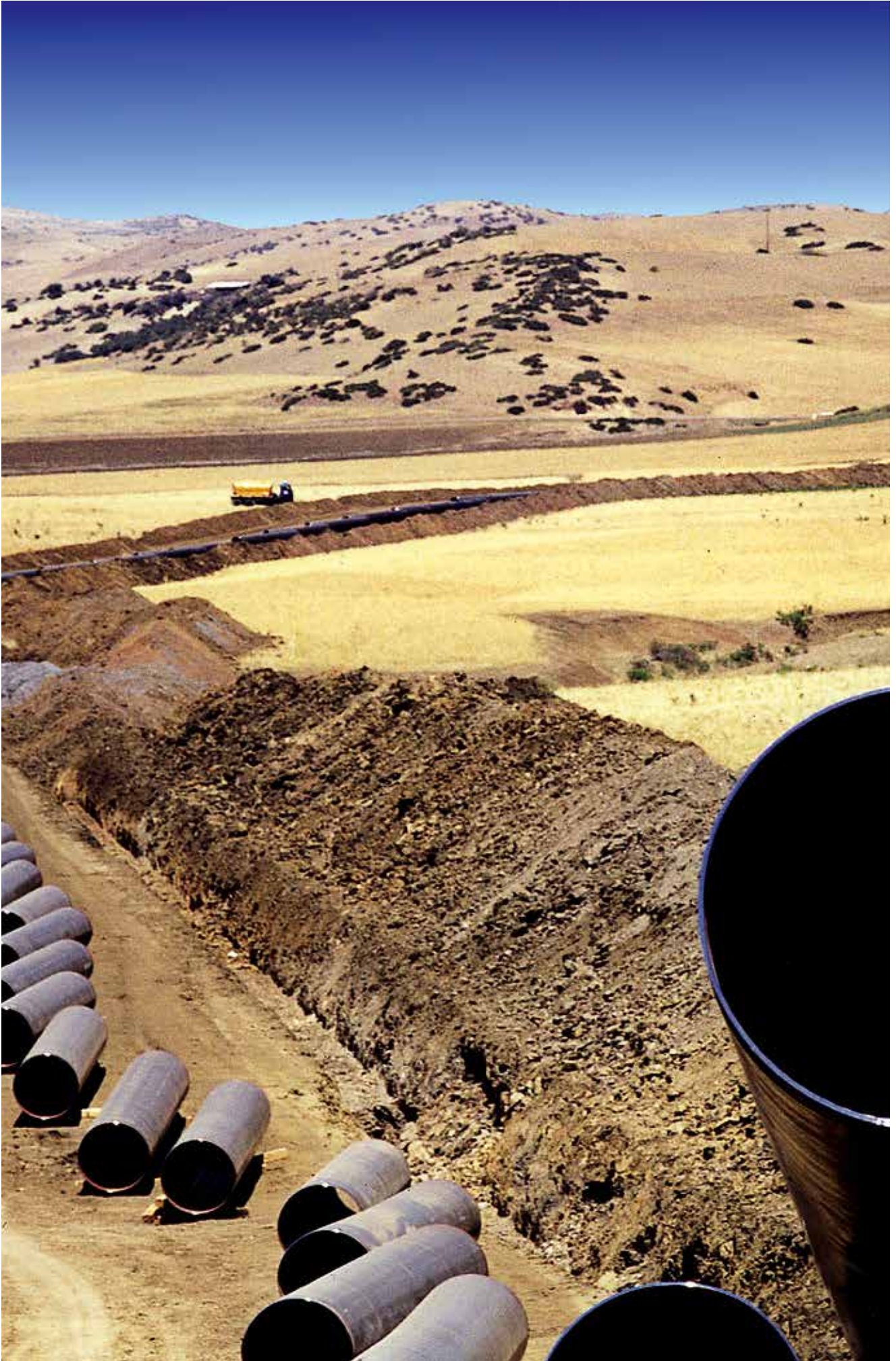
The linepipes for sour service are characterised by high resistance to HIC, achieved by means of lean chemistry and highest steel cleanliness. This ensures that the steels have a low hardenability, and the formation of inclusions and precipitates detrimental to HIC is avoided. To meet the requirements for

other properties such as strength, toughness, weldability and fabricability, the steel composition and the process parameters for the steel making and plate rolling must be extremely well coordinated.

One key factor in this is a steel mill process that provides materials with low carbon and low sulphur and a high degree of cleanliness.

Another critical element is the optimisation of the weld metal composition, meaning that its hardening behaviour is comparable to that of the plate material while required toughness is maintained.





HIGH-STRENGTH MATERIAL IN THE ARCTIC

Pipelines tend to become longer and require higher operating pressures. High strength steels like X80 are established steel grades for these types of pipelines and have been proven to deliver substantial cost savings. EUROPIPE has manufactured more than a third of all X80 pipelines installed worldwide, beginning more than 25 years ago. In addition, we have manufactured X100 pipes for onshore projects as well as X120 pipes for development purposes.

Each project however has different specifications regarding steel grades and longitudinal strength requirements. These we are able to fulfil by utilising the inherent strengths of our group.

The Arctic region holds approximately 22 % of the world's undiscovered hydrocarbon resources and is therefore a potentially attractive area for oil and gas development. However, the challenges are manifold and unique in their nature, such as temperatures of 40°C below zero, almost non-existing supply-chain infrastructures and short seasons. The large-diameter pipe is a key factor in determining the success of developments in this part of the world. Deadlines, logistics and material of pipes have to be perfectly coordinated to ensure that a pipeline is completed on-time and according to budget.



The initial challenge is the material. At very low temperatures, the energy-absorption properties of steel are vastly different when compared to ambient temperatures. EUROPIPE has the know-how and experience to adjust the material properties of the steel to ensure compliance with such temperatures.

The second challenge concerns thaw settlement. Seasonal or operating temperature induced thaw settlement or ground movements may cause lateral forces to the linepipe, which mean higher additional requirements in longitudinal direction compared to standard onshore pipelines. Strain-based design requires the control of deformation behaviour and the shape of the stress strain curve. This is a factor of crucial importance. EUROPIPE is able to fulfil these requirements due to of the close integration of all steps of the pipe manufacturing value-chain.



READY FOR THE ENERGY FUTURE

Large-diameter steel pipes can be used for a variety of energy transportation mediums. The most interesting relate to future uses of existing components of energy production and new energy sources.

Special products

Many non-linepipe applications, especially in the fields of civil and marine engineering as well as offshore construction, require the use of steel pipes. These are EUROPIPE's standard products. We deliver high quality pipes for these markets and are able to do so even in small quantities.



In addition, by integrating EUROPIPE's strengths in steel expertise, production capabilities and exhaustive R&D resources into our customers' projects, we are able to maximise our support for new pipe solutions fit to face new challenges.

For example, EUROPIPE pipes are used for a new method of marine gas transportation in which pipes are installed on ships as perfectly adapted containers for the storage of gas during transportation.

These compressed natural gas (CNG) ships provide the economical solution for stranded gas fields which are not large enough to be connected to the market with conventional technologies. CNG vessels require pipes being capable to withstand high fatigue loads resulting from pressure differences during gas loading and unloading. EUROPIPE developed the Hifa®Pipe specifically for these types of applications for its partner Knutsen O.A.S Shipping. This Knutsen CNG technology is named PNG® (Pressurised Natural Gas).



Clad pipes

The use of corrosion resistant alloys (CRA) for linepipe often represents the only solution to withstand corrosion in situations where inhibition and gas processing is not practicable. Clad pipe combines the excellent corrosion behaviour of high-alloy materials such as Nickel based alloy up to the grade of Inconel 625. The combination of high strength carbon steel with metallurgical bonded CRA overlay provides a highly economic solution compared to solid CRA pipes.

EUROPIPE has mastered the challenges of producing this type of pipe from clad plate.

Carbon Capture and Storage (CCS)

CCS is widely seen as a suitable means to reduce the amount of CO₂ released into the atmosphere. Approximately 7,500 large point sources emitting more than 100,000 tons of CO₂ are responsible for 56% of the world's anthropogenic CO₂ emissions.

The CO₂ emitted in this way from power stations and other energy intensive industries can be captured and stored underground in geological formations such as empty gas wells or saline aquifers. Most of the sites that can be used for carbon storage however are far away from the sources of CO₂. The most secure and economical means of transport is the use of pipelines.

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