Coating

EUROPIPE

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, have enabled us to achieve some very ambitious goals.

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 five mills in Europe, the USA and Brazil, producing annually 3,000 kilometres of large-diameter pipes 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 enables us to deliver top performance in every challenge we approach, especially when it comes to creating products, the quality of which has determined our market for many years.

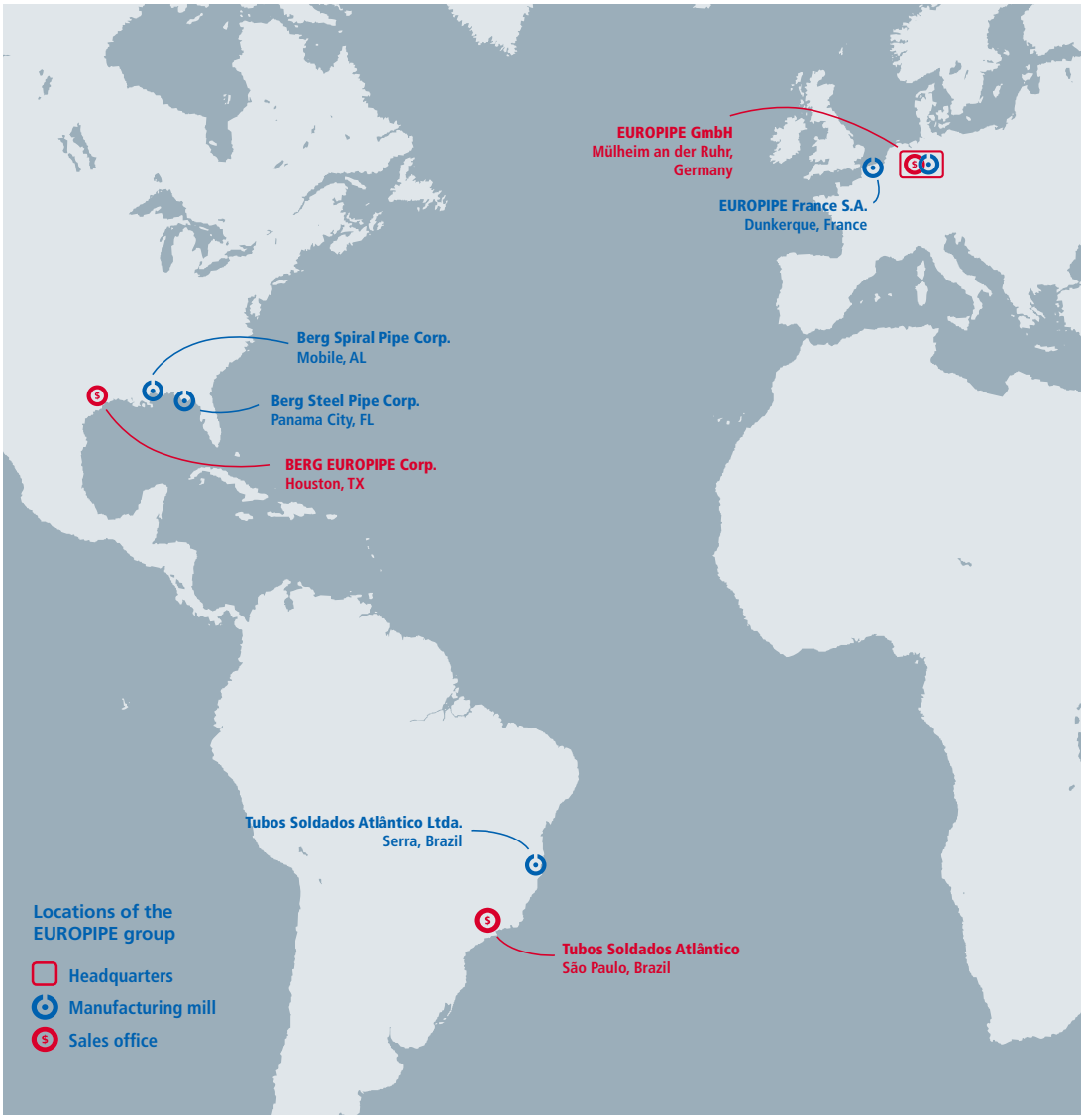
One key factor enabling this is the close integration of all relevant steps in the value chain. From steel-making to plate rolling, pipe manufacturing and coating, all participants in this steel symphony know their roles and responsibilities in detail. The coating stage as the crucial last step in the production of large-diameter pipes serves to protect what we have manufactured.

A PROTECTIVE ENVIRONMENT

Pipelines made of steel need to be protected when laid and most importantly during the decades that they are in operation. This ensures protection against corrosion and mechanical damage as well as enabling the transported medium to flow in the smoothest possible way.

All the technology, know-how and quality assurance in place during steelmaking, plate-rolling and pipe manufacturing are best maintained if the finished pipe is coated right after production.

This is why we at EUROPIPE believe that the coating stage has to be an integral part of the large-diameter pipe manufacturing value-chain. All of our five pipe mills worldwide have either an integrated coating plant or a trusted coating partner in their direct vicinity, like our wholly-owned group companies MÜLHEIM PIPECOATINGS GmbH (MPC) in Germany and eb Pipe Coatings Inc. (eb) in the USA. All coating plants are sized in order to be able to match the capacity of their respective local group pipe manufacturing facilities.



This end-to-end supply chain not only allows the best technical solutions to be implemented, including meeting and exceeding all required quality standards, but also offers a significant advantage for our customers in terms of delivery, logistics and the commercial aspects of pipeline projects, such as:

- eliminating sign-off steps between the pipe production and coating stages
- a standardised quality control and documentation system
- reduced total supply chain costs
- a unified project-management

It goes without saying that the close proximity of all the subsidiaries involved in the process allows for an unrivalled collaboration in research and development and quality assurance. While the operational management of the coating plants is always local, all process, engineering and material improvements are coordinated by MÜLHEIM PIPECOATINGS in Mülheim, Germany, as the technical centre of excellence. With far in excess of 4.5 million square metres of inside and outside coating capacity per year, this facility is the largest of its kind in our industry.

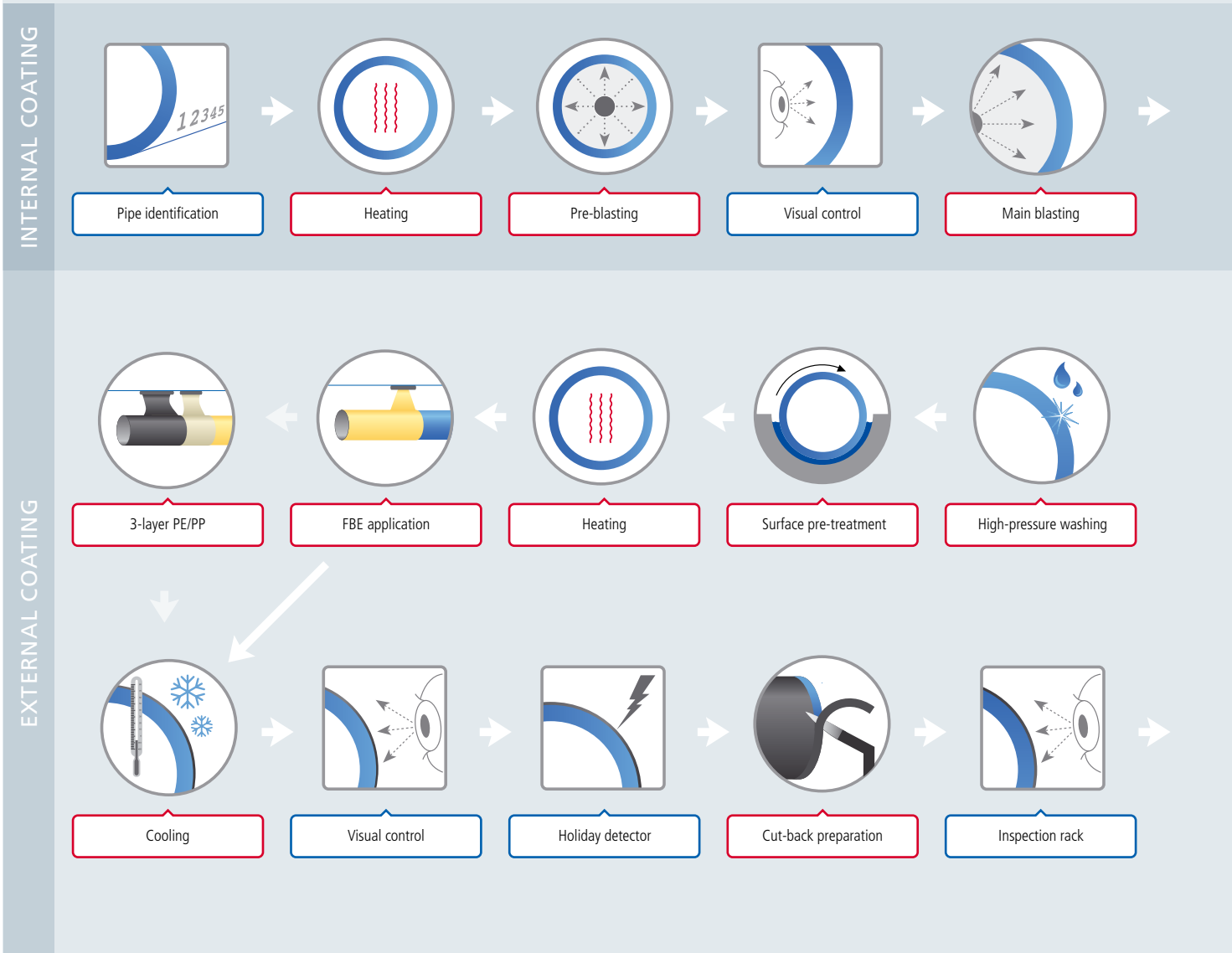
A CONTROLLED PROCESS

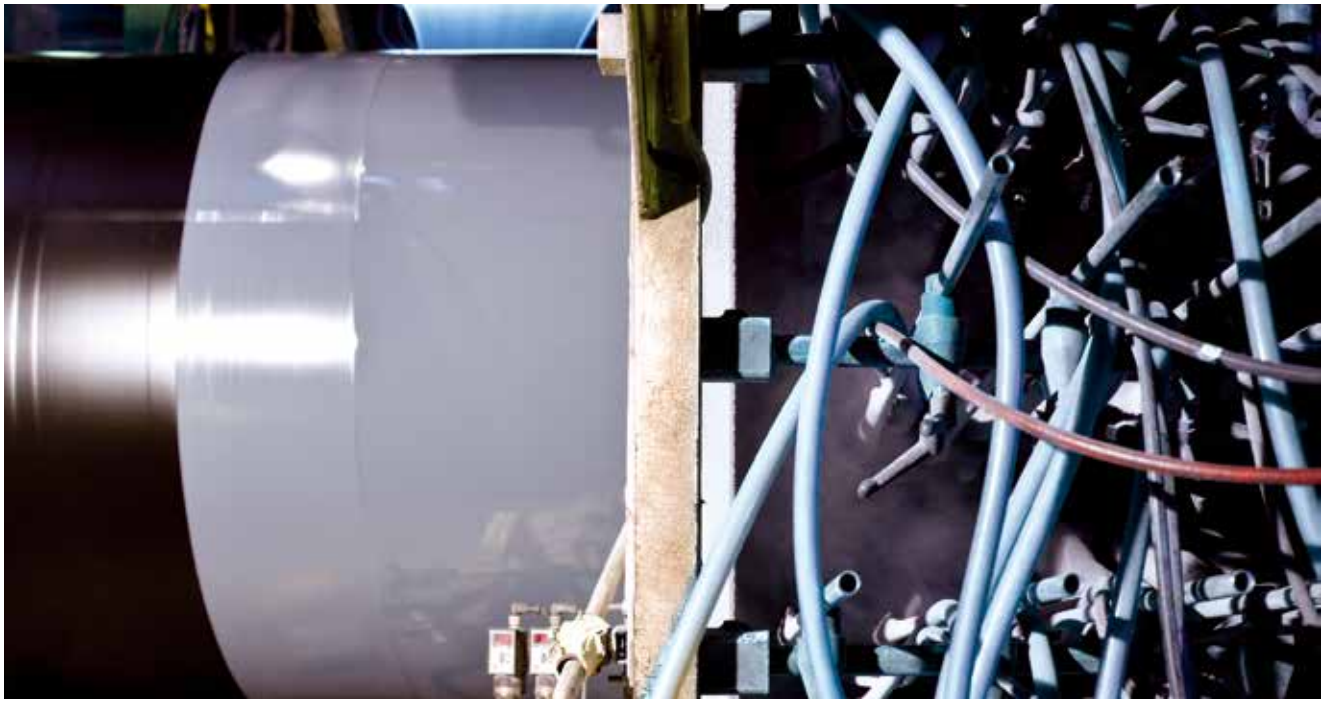
At EUROPIPE, we see the keys to superior products and quality as being in the mastering and control of all relevant processes by our employees. State-of-the-art equipment and software has to be operated by the highly qualified people. This is especially true for our coating business and enables us to take on the most demanding projects with the tightest of timelines.

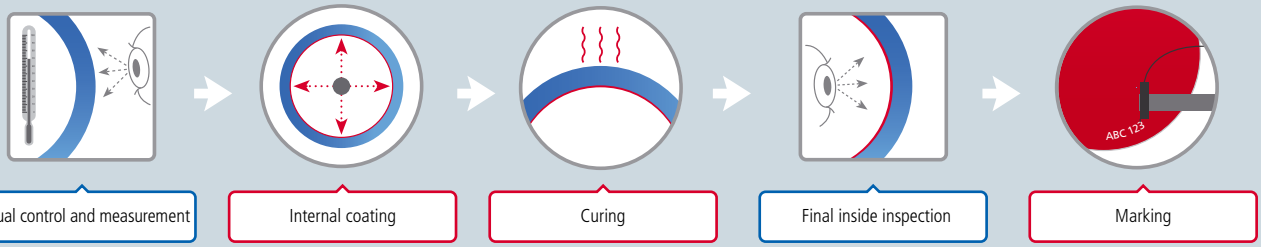
The focus of our constant quest for improvements lies in:

- finding even better coating and lining solutions in close collaboration with the coating material suppliers,
- further improving the pipe surface preparations,
- achieving better results in terms of process control, throughput time and coating quality by a constant fine-tuning of the manufacturing processes.
- increasing productivity, quality and work safety by investing in new machinery and logistics systems,
- protecting the environment by reducing immissions and emissions from the coating process.

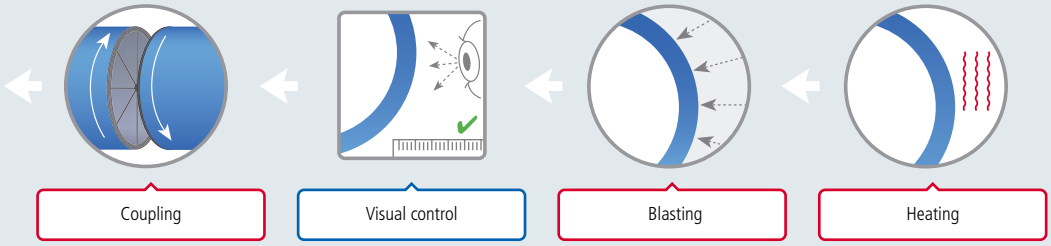
PRODUCTION FLOW



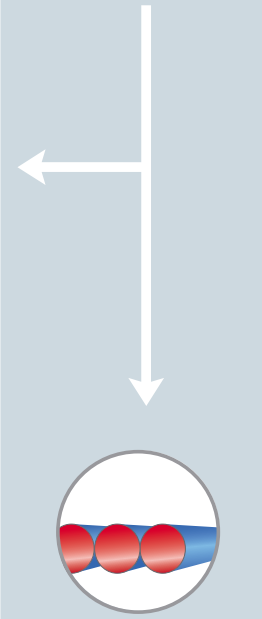




Visual control and measurement | Internal coating | Curing | Final inside inspection | Marking



Coupling | Visual control | Blasting | Heating



Storage

Marking | Generation of certificates | Shipment

Quality control

Production

Production steps may vary slightly between production lines

COATING RANGE

EUROPIPE offers a whole range of technically optimised, cost-effective coating solutions. In the case of multi-layer polyethylene/polypropylene (PE/PP) systems, robust polyolefin coatings are applied to a fusion bonded epoxy (FBE) primer. The coatings produced in this way display high electrical resistance. Used in conjunction with cathodic protection, pipes achieve service life well in excess of standard specifications.

Multi-layer PE and PP coatings develop their full anti-corrosion effect at thicknesses of as low as 1 mm. However, the coating thicknesses specified in standards are higher, usually in line with pipe diameter so as to provide additional protection against mechanical damage due to compressive and shear forces during transport and installation.

Where stress and strain is particularly severe, even thicker coatings are used. PE is the standard solution, while PP allows higher service temperatures and provides better mechanical properties in terms of indentation and impact resistance.

Coatings can be designed to deal with service temperatures of up to 120°C. The materials used and the various layer thicknesses within the coating system are important factors. FBE offers excellent adhesion on steel and is used in thicknesses of approximately 400 µm for single-layer coatings.

3-Layer Polyolefin Coatings

- FBE PRIMER: 1st layer – Epoxy powder spray-applied with electrostatic guns in typical thickness of 80 – 250 µm.
- COPOLYMER ADHESIVE: 2nd layer – Copolymer bonding layer extruded in typical thickness of 250 µm.
- POLYETHYLENE: 3rd layer – Outer polyethylene layer extruded in typical thickness of 1.2 – 3.5 mm, possible increase to over 10 mm. Service temperature up to 80 °C.
- POLYPROPYLENE: 3rd layer – Outer polypropylene layer extruded in typical thickness of 1.2 – 3.5 mm, possible increase to over 10 mm. Service temperature up to 120 °C.

Fusion Bonded Epoxy Coating

- FBE DUAL LAYER: 1st layer – Corrosion protection epoxy powder spray-applied with electrostatic guns in typical thickness of 250 – 275 µm.
- FBE DUAL LAYER: 2nd layer – Mechanical protection epoxy powder spray-applied with electrostatic guns in typical thickness of 375 – 625 µm.
- FBE MONO LAYER: Epoxy powder spray-applied with electrostatic guns in typical thickness of 350 – 450 µm.

Flow Efficiency Coatings for gas pipelines
Liquid Epoxy Coatings for water pipelines

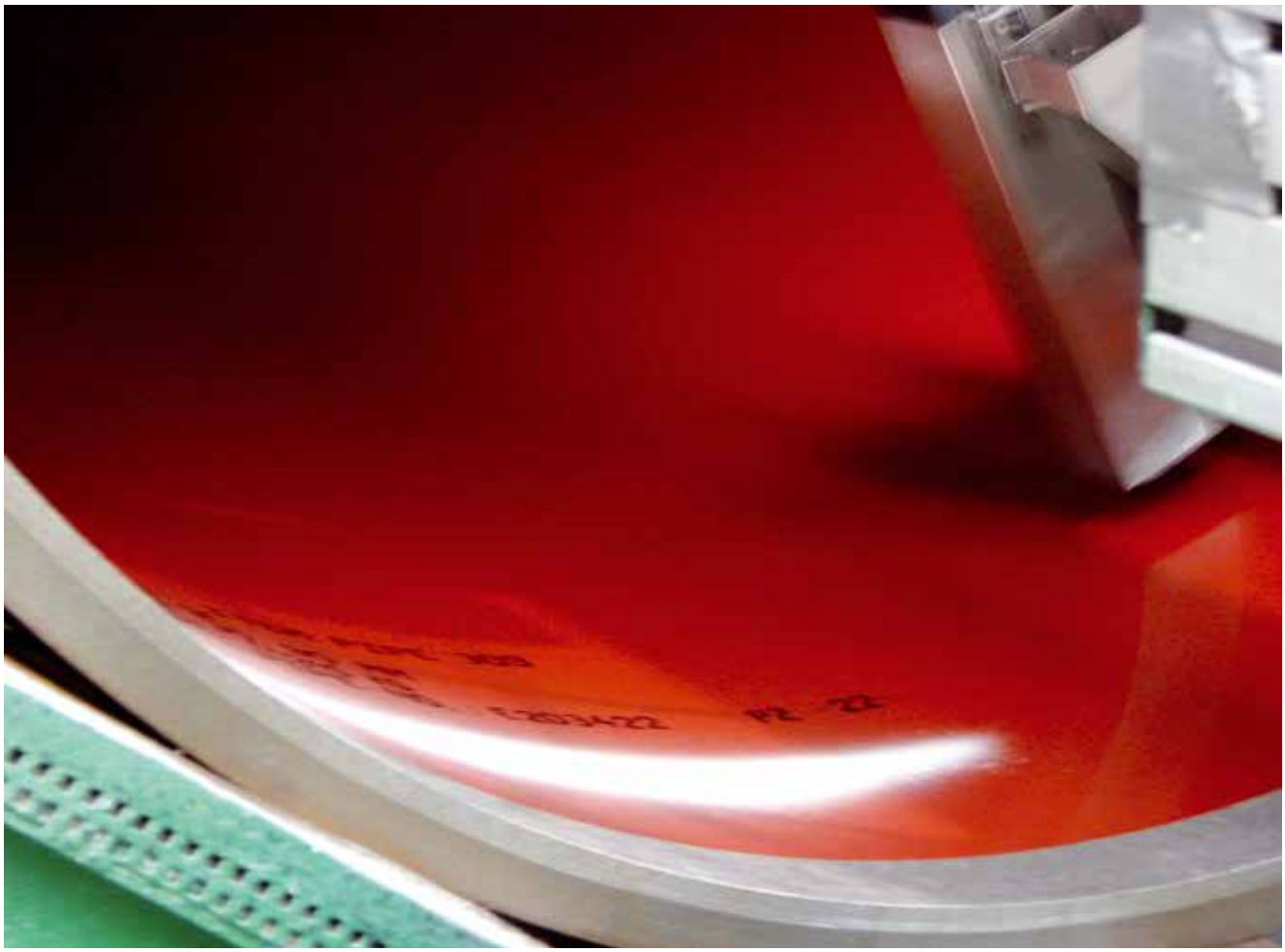
- FLOW EFFICIENCY COATING: Liquid epoxy sprayed in typical thickness of 60 – 100 µm for gas pipelines.
- LIQUID EPOXY COATING: Liquid epoxy sprayed in typical thickness of 400 – 500 µm, e.g. for water pipelines.

For increased resistance to mechanical loads, additional layers of special epoxy can be applied. This is known as a dual FBE coating or abrasion-resistant overlay (ARO).

Pipes for offshore installation are given a non-slip coating regardless of whether or not they are subsequently coated with concrete. This is done by applying polyolefin and FBE coatings with textured surfaces, or by including fine particles in the coating (sandpaper effect).

Besides coatings for oil and gas pipes, EUROPIPE supplies solutions for the long-distance transportation of both drinking water and waste water. The internal linings used for such requirements are based on epoxy and are available for pipes and fittings. The external coatings are identical to those for EUROPIPE oil and gas pipelines.

Coating is precision work. Not only does the coating have to be tailored to the climatic conditions in the field and the properties of the product to be conveyed, it also has to protect the pipe during transport, storage and subsequent installation.



CERTIFIED QUALITY

All our coating facilities are equipped with the latest in technology and software to capture, transmit, archive and evaluate all relevant quality data. Because of our integrated data networks, we can supply information at any time about the manufacturing and inspection status, and the whereabouts of every single pipe.

Our quality management systems are based on internationally recognised standards. EUROPIPE and our coating yards are ISO 9001, ISO 14001 and OHSAS 18001-certified. In addition, all our internal and external coating partners are audited annually by EUROPIPE.

RESEARCH EXCELLENCE

There is no area in which the value of our integrated approach of supplying a coated pipe is more visible than in research and development. This was true in the past and is still true today. For example, one of our predecessor companies, Mannesmannröhren-Werke AG, developed the 3-layer coating method, which is the oil and gas industry standard for outside coating in many parts of the world.

PATENT SOLUTIONS

Today, we are working on many exciting projects which could have similar impacts on the way large-diameter pipes are coated and protected.

Our efforts in the areas of processes and manufacturing during the last decade have yielded significant improvements in terms of throughput time and quality.

We expect the biggest effect, however, to be on materials. Here, we have patented a solution in which a 3-layer anti-corrosion coating system, with a protective outer layer of cross-linked PE, gives a step-change in the protection of the coating against sharp objects during transport, laying and operating time. The bed of fine-grained sand in which pipelines are normally laid can be done away with. This saves a great deal of material and effort during pipe-laying.

A second marketable product is the crack-arrestor, a steel pipe part with fibre-reinforced wrappings that is applied off-line. They are used to stop the propagation of cracks in pipelines by reducing crack speed to below critical in the wrapped section.

The third and most radical approach is the EUROPIPE Safety System, which is a fibre-reinforced FBE coating that elevates the strength of the coating due to various fibre layers, consuming the energy from the crack caused by a defect. This coating can be applied online in our coating facilities and requires no special logistical or field-welding efforts.

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