OFFSHORE
SUBSEA COATINGS AND INSULATION
COMPLETE COATING ASSURANCE
How do you overcome the constantly-changing challenges of coating offshore pipelines? Read on.

Every trend in offshore is leading to more complexity. Bigger projects, tighter schedules, deeper water, harsher conditions, longer tiebacks, higher thermal and mechanical stresses, tougher QC requirements. The margin for error offshore is razor thin, and any failure or delay has an exponential effect on costs.

A different model and a better way
While offshore challenges continue to mount, pipeline coating approaches have remained intolerably stagnant. Not anymore. Bredero Shaw offers Complete Coating Assurance – the first and only offshore pipeline coating model that meets offshore challenges head on and solves them.

This model is a game-changer because it’s the one approach that combines both line pipe and field joint coating into a complete package of integrated services. It addresses every stage of the project to create a complete system that ensures coating integrity across the entire pipeline. Bredero Shaw performs every step of the process, from engineering the advanced coatings, to assisting design and validating the solution, to line pipe coating and field joint application. In the end you get highly compatible coating interfaces during spooling and installation, a system that performs at depth for decades, and reduced risk for your pipeline now, and decades from now. That is what success looks like in today’s offshore environment. That is Complete Coating Assurance.

Fully accountable to you
Complete Coating Assurance comes with a robust warranty that covers the coatings and the pipe and field joint interface. We confidently offer such a high level of coverage because we provide an integrated line pipe and field joint coating design, and control every step in the coating process. Our breadth of experience is unmatched, and so is our track record for delivering successful projects. In fact, we are so attentive to every detail that we don’t anticipate you will ever need our warranty, but we are proud to take full responsibility for our work no matter what. With Bredero Shaw you have one reliable source, one point of accountability, one company backing you all the way.
Complete Coating Assurance starts with advanced engineering. Based on customer needs and new offshore challenges, our expert team develops new coatings, application processes, and equipment that deliver reliable thermal performance you need to keep your hydrocarbons flowing through your pipeline over the long term. This can include the development of custom coatings for special conditions such as high-temperature applications for the full array of ancillary subsea structures and field joints.

We are adept at designing both passive and active insulation systems. We have developed our own design tools that model the complex interplay between water depth, temperature and time.

Constantly innovating
Bredero Shaw is the world’s premier pioneer of pipe coating advancements, with more than 100 patents covering new products and process technologies. And there’s much more to come, because we never stop listening to our customers so that our products and technology will address their challenges. The new coating concepts we develop can move quickly to field application.

Our state-of-the-art R&D center in Toronto provides unmatched material science capabilities. Plus our world-class R&D flow assurance center in Norway regularly develops and tests new concepts for line pipe coatings, injection moulding, the casting of field joints and custom coating solutions. The center is housed within one of our full-scale production facilities, which allows us to transition quickly from the lab to the real world through rapid scale up, testing and commercial release of new innovations.

Always on spec
Many of our products are developed to meet certain international and corporate standards and specifications, which often differ greatly and require extensive up-front scrutiny. Our experienced research scientists and QC personnel work with customers to ensure that all standards are met, verified and documented. We also work with ISO, NACE, DNV, ASME and other organizations to set international standards.
With Complete Coating Assurance you’re getting an end-to-end solution. We believe it is imperative to design the line pipe and field joint coating systems up front to ensure compatibility and help prevent installation surprises in the field.

Our specialists draw from a wide range of advanced coatings to create the right system for the application, including proposed materials, geometries, temperature ranges and field practices. We can also quickly qualify a variety of systems to determine the best approach to meet your specifications.

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For your project

Our coating systems are designed so that we are always ready to meet your needs. We combine your project conditions with our own extensive knowledge of how coating products respond to the effects of temperature, water exposure and hydrostatic loading over time.

We focus on coating performance, but that’s just the beginning. Our goal is to deliver unequalled efficiency and flexibility to your entire project. We explore various ways to optimize manufacturing and logistics, from pipe fabrication and handling to pipe lay to final operation. And we encompass all system factors, such as buried sections, need for buoyancy, and integration of anodes, cables, tees and other ancillary structures that may require custom coatings. From this we build a production strategy that ensures quality, efficiency and compliance.

As the project gets closer to real-world deployment new parameters often present themselves, and we are always ready to adapt. We regularly fine-tune, rework and re-cost our products and processes, working closely with customers to make sure we always have the best technical solution for current factors. Finally, we deliver a report that outlines the details and assumptions for the optimal performance of the system.
The next step in providing Complete Coating Assurance is to fully validate that our concepts are ready for deployment.

**Product Qualification Testing (PQT)**
We operate the most advanced testing tool in the industry – our Simulated Service Vessel (SSV). This state-of-the-art equipment simulates the most extreme temperatures and pressures that your pipeline may experience internally and externally, so you can be certain that the pipe and joint coatings will perform as expected over the long term.

We also perform testing to simulate the various loads and stresses that the coated pipes will undergo during reeling, handling, transport, job preparation and installation. We test for:

- Stinger-roller interaction
- Axial shear loading
- Impact resistance
- Tensioner gripping effects
- Resonant fatigue

We also perform extensive validation work in the laboratory to document the performance of all components, from raw materials to complete applied systems. These tests include:

- CD testing
- Compression testing
- Hot water
- Creep behavior
- Material verification
- Aging of materials
- Tensile testing
- Pre-testing

**Product and Process Validation (PPV)**
We know that the testing environment is very different from the real production world, so we conduct PPVs to prove we have the capability to manufacture our designs at commercial rates. We work closely with you to establish standard Inspection and Test Plan (ITP) requirements. Once a PPV is completed, we furnish plant operations with a comprehensive report documenting our performance versus the ITP standards.

When it’s time to deploy, our commitment to validation continues. We conduct testing to demonstrate that the project design is meeting your specifications. This testing also serves to detect potential challenges and points of failure that could arise during pipeline deployment and operation. In some cases we discover a new performance parameter, and we are able to make proactive adjustments before problems can occur. We also constantly test and qualify our latest products so we can continually offer our customers innovative coating approaches.
A major part of providing complete assurance is having the ability to deliver at every stage of the process. Bredero Shaw has built the most extensive and most capable infrastructure in the world for executing complete pipeline coating projects – no matter how large, complex or remote they may be.

We have abundant line pipe coating plant capacity. We have dedicated storage and loading berths in key ports. We have the ability to mobilize anywhere to provide our expert field joint coating operations. And we have the industry’s most competent and responsive logistics management organization. In short, we have everything it takes to get any job done, anywhere – on time.

**Safety first**
Successfully running a worldwide logistics infrastructure starts with safety. From our top executives to our personnel deployed around the world, Bredero Shaw’s commitment to HSE runs deep. Our people are held accountable to produce industry-leading health, safety and environmental results at the site, regional and global levels. And we have experienced and well-supported HSE staff at every location. Every day, everywhere, our ultimate goals are to do our jobs without incident or injury and to have outstanding environmental performance.

**Unmatched resources**
Bredero Shaw has six strategically located thermal insulation line pipe coating plants around the world, as well as a state-of-the-art mobile plant. This is coupled with our worldwide field joint capabilities to give you a completely integrated coating solution at your site. Plus our mobile operations utilize local content and production resources, which saves logistics costs, puts the end product closer to your project, and reduces the risks of transit damage. Our logistics capabilities also include pipe handling, inspection, tracking, storage and direct shipment to any destination.
Thermal Insulation Coating Plant Locations
Houston, Texas
Orkanger, Norway
Kuantan, Malaysia
Kabil, Batam Island, Indonesia
Belo Horizonte, Brazil
Veracruz, Mexico
Brigden™ (mobile worldwide)

Bredero Shaw can provide the coated line pipe you need, on time, anywhere in the world. We can mobilize full-service production capabilities to any location with our proprietary Bridgen™ mobile unit. Plus we have six thermal insulation coating plants placed strategically near many of the world’s most active hydrocarbon production regions.

The most advanced processes
We have the technology and capabilities to provide any type of line pipe coating to achieve the highest levels of thermal insulation and anti-corrosion performance. Our processes include:

Side Wrap Insulation
Pipe is helically conveyed and various layers of FBE and polypropylene or ULTRA™ are applied to the desired thickness, much like handlebar tape is applied on a bicycle. Multiple layers can be wrapped over one another.

Cross Head Extrusion Insulation
Pipe is axially conveyed through a ring die that draws insulation down where it fuses to the surface to create an irreversibly strong bond. Multiple thick coating layers can be applied.

Casting of Thermoset Materials
This low-pressure process places a mould around the pipe, and the coating material is pumped into the void between the mould and pipe where it adheres to the substrate.
We’ve said this previously, but it bears repeating. The key to executing a highly compatible line-pipe to field-joint interface is to design and test them both up front as an integrated system. And Bredero Shaw is the one company with the engineering competency, resources and passion to do this.

Our coating systems ensure the welded joints are just as protected as the line pipe against corrosion and extreme temperatures, to prevent cold spots, cracks and failures during installation and over the long term. And because they are designed and tested as an integrated system, application and installation is easier and faster.

We know that in the offshore industry, conditions today are likely to change tomorrow. Bredero Shaw’s Field Joint Center of Excellence helps our customers succeed in this rapidly changing environment. Here our engineers and materials scientists work to keep our field joint technology at the leading edge. We continually innovate to improve reliability and safety. We also can readily modify our designs to meet your specific project requirements and reduce equipment footprint to save valuable space.

What it takes to get it done
Bredero Shaw has performed field joint coating since 1990. We have worked in every major production region worldwide, under all environmental conditions. Recent mobilizations include Angola, Brazil, Nigeria, Australia, Malaysia, Vietnam, Norway, the U.K. and the U.S. We are ready to execute your project anywhere you need to be.

We will survey your installation vessel and modify our equipment for it. Plus we put our equipment through a readiness test before deployment. During installation you can count on our people just as much as our coatings and equipment. Our operators and supervisors have decades of experience mobilizing to spoolbases, fabrication yards, permanent and temporary project sites, and offshore pipelaying vessels. And they receive ongoing training on equipment, products, processes and safety to ensure smooth operations.
Complete Coating Assurance is today’s model for offshore success. We have completed projects of all sizes and complexity all over the world, and our list of successes continues to grow. Here are a few recent highlights.

**Goliat: Norway**
Operator: Eni Norge  
Contractor: Technip  
Pipeline: 22 km  
Depth: 400 m  
Products: Thermitite® ULTRA™, ThermoFlo® 1400

The Goliat field is the first major development in the Arctic. Working this project means contending with adverse sea conditions, low temperatures, presence of sea ice, a fragile ecosystem and a complex subsea production network with multiple manifolds, trees, control systems, umbilicals and workover systems.

Bredero Shaw designed and executed an end-to-end coating approach for most of the transport system, including flowlines, umbilicals and risers. Our teams applied line pipe coatings at our permanent facility in Orkanger, at the pipeline contractor’s spoolbase and at two subsea contractor locations. We later mobilized to the spoolbase to perform the field joint coating.

**Pluto LNG: Australia**
Operator: Woodside Energy Limited  
Contractor: Allseas  
Pipeline: 422 km  
Depth: 85 - 830 m  
Products: 3LPP, Thermitite® Deep Foam

The Pluto field was the fastest LNG project ever developed. There were several engineering challenges for the coating system, including the need for negative buoyancy on large-diameter pipe, as well as a rough outer surface to improve safety and handling. The field joint stage was also the largest scope ever specified for injection-moulded technology.

Bredero Shaw designed and executed a coating system that consisted of seven layers of alternating materials on the line pipe to provide thermal, anti-corrosion and weight properties. The outer layer was machine tooled to reduce slippage. We then coated 4,500 field joints with injection-moulded polypropylene (IMPP) at a cycle time of 7 minutes per joint – an industry first. We customized our IMPP equipment to accommodate the production advantages of the S-lay vessel.

**Jack/St. Malo: Gulf of Mexico**
Operator: Chevron  
Contractor: Technip  
Pipeline: 92 km  
Depth: 2,100 m  
Products: 3LPP, SPP

The Jack and St. Malo fields are situated 40 km from each other in the deepwater GOM. Both fields are developed via a massive semi-submersible production facility with a capacity of 170,000 bopd and 42.5 mmscf per day of natural gas. Bredero Shaw provided the coating solution for the subsea pipeline.

We coated the line pipe with a 3-layer polypropylene anti-corrosion coating and syntactic polypropylene thermal insulation. We performed the line pipe work using our new Brigden™ mobile technology. We then applied injection-moulded polypropylene field joints at the contractor’s spoolbase in Alabama. Before deployment we rigorously tested the design in our Simulated Service Vessel to validate its performance and compliance to specifications.

A growing list of success stories
Customers of all sizes around the world are finding out what it means to have Complete Coating Assurance. Here are some of our recent projects that are either completed or well underway.

- Shell Princess – Beaumont/GOM
- Balboa – Pearland/GOM
- BC-10 – Brazil/Brazil
- Inpex Ichthys – Kabil and Kuantan/Australia
- Chevron Wheatstone – Kuantan/Australia
- Apache Julimar – Kuantan/Australia
Whether you’re building an offshore pipeline or controlling the asset once it goes into service, there are inherent risks. During construction any number of issues can impede your progress, from materials shortages to installation challenges to delivery delays. And over the long term, design flaws can threaten the integrity of your pipeline and even shut it down. But with Complete Coating Assurance these risks are reduced in multiple ways.

**Project Assurance**
If you have an interface failure between the line pipe and field joint coatings in the field, your operation is quite literally dead in the water. With up-front integration of the line pipe and field joint system, the interface works. Our coatings are advanced, our validation regimen is unrivaled, our execution is proven. We attend to every detail of your project. To us, thoroughness leads to success.

**Schedule Assurance**
Bredero Shaw handles the complete job, leaving nothing to chance with outside vendors. You get exactly what you need to complete your project, with no unpleasant surprises impacting your schedule. All in all, we offer the largest validation, production and logistics management infrastructure in the world, so you can count on us to get the job done on time.

**Performance Assurance**
We know how to create coating systems that perform. We regularly handle the largest-scale, highest-complexity projects that call for multiple integrated coatings. We have the widest range of products, and we invest heavily in R&D to keep our technology at the forefront. We also utilize the most sophisticated simulation equipment to prove that our designs will stand up to the harshest environments over the long term. With Bredero Shaw you have Complete Coating Assurance now, and decades from now.

But the first step is to start today. Contact us and let’s discuss your specific offshore challenges – and how we can turn them into offshore success.
The global leader in pipe coating solutions

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