CASE STUDY

HDD Pipeline Project

HDD Pipeline Protection

ENGINEERING THE NEW GOLD STANDARD FOR PLANT-APPLIED DENSO BORE-WRAP®

Full-length HDD pipe prepared for factory-line mechanical protection.

Bore-Wrap application begins under controlled plant conditions.

Welspun's coordinated application team converts a hand-applied system into a repeatable plant process.

Project Data

Location	Anjar, Gujarat, India
Completion	2026
Project Type	Plant-applied HDD full encapsulation
Products Used	Denso Bore-Wrap® System

Project Details

Composite overwrap systems for horizontal directional drilling (HDD) protection are often associated with girth welds, bends, repairs and other localized applications. At Welspun Corp Ltd's coating facility in Anjar, Gujarat, India, the concept moved into a larger category: full-length plant application over massive FBE-coated mainline pipe.

Each pipe joint length measured approximately 914 mm (36 in.) in diameter, with a 19.0 mm (0.75 in.) wall thickness and 18.3 m (60 ft) individual length. The pipe had already received a dual-layer fusion-bonded epoxy (2LFBE) system, which needed to remain intact through storage, handling, transportation, welding and final HDD pullback.

THE CHALLENGE

Add an additional robust mechanical protection over a completed 2LFBE corrosion barrier without damaging the primary coating over large diameter pipe joints in a plant environment.

THE SOLUTION

Engineer a controlled plant-line method for full-length Denso Bore-Wrap application using rotation, hydration, 50% overlap, compression, venting and cure control.

Creation of the Gold Standard Application Solution

The defining achievement of the Anjar project was not simply that Denso Bore-Wrap was applied to large-diameter pipe, it was that Welspun developed a practical factory-line method for applying a product traditionally installed manually. The pipe lengths were too large, too heavy, and too long for a conventional manual wrapping approach to be efficient.

To solve that, Welspun built the application around controlled mechanical pipe rotation, allowing each 18.3 m (60 ft) pipe length to turn steadily while a crew of twelve operators advanced the Bore-Wrap in a continuous spiral pattern. This approach changed the application from a labor-heavy field procedure into a coordinated mainline plant operation.

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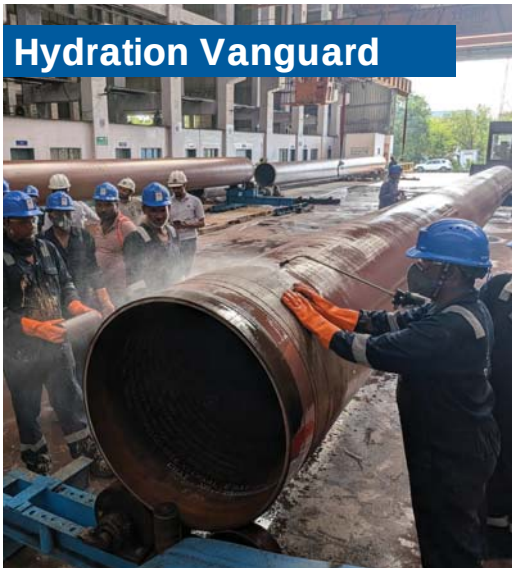
Hydration Vanguard



Logistic Feed

Lead Applicator

Hydration Vanguard	Two operators used specialized battery-powered water sprayers to continuously mist both the incoming substrate and the unrolling Bore-Wrap, activating the moisture-cured resin.
Logistics Feed	Two crew members staged, inspected and opened the hermetic foil pouches, feeding active rolls to the application lead precisely as the line advanced.
Lead Applicator	Two operators used specialized battery-powered water sprayers to continuously mist both the incoming substrate and the unrolling Bore-Wrap, activating the moisture-cured resin without oversaturating the matrix.
Compression Tier	Immediately behind the lead applicator, one worker applied constant manual tracking pressure to the freshly laid wrap edges for layer-to-layer bonding. Two additional operators then applied clear sacrificial Denso Poly-Wrap under high tension, creating a compression shell that promoted uniform resin wet-out through the fiberglass weave.
Matrix Venting & Out-Feed	Two operators perforated the poly-wrap to allow carbon dioxide gas, excess resin and water to escape cleanly. A final operator controlled the primary mechanical pipe rollers for smooth, uninterrupted rotation during roll changeovers and tie-ins, while support personnel managed water reservoirs and staged the next pipe.

Application Controls That Made the Process Repeatable

Rotation + Overlap
Mechanical pipe rotation allowed continuous wrapping, while a single lead applicator maintained a uniform 50% spiral overlap.

Hydration + Cure
Sprayers misted both the substrate and incoming wrap to activate the resin, followed by compression poly-wrap to support wet-out.

Venting + Flow
Perforation allowed carbon dioxide, excess resin and water to escape while roll staging and roller control kept production moving.

Pipe-End Treatment for Future Field Welding

Because individual pipe lengths would later be field welded, the factory termination detail was reviewed against the future girth weld coating sequence. The quality team modified the factory end treatment to a single-layer termination to reduce the chance of excessive four-layer buildup after welding and field overwrap application.

For HDD pullback, smoother coating geometry can help reduce raised-edge contact and abrasion. The lesson is practical: factory coating decisions should be coordinated with welding, girth weld coating, final overwrap profile and installation stresses.

Hardness Procedure Refined

Wide-foot hardness gauges produced inconsistent results on the curved, textured composite surface. The team moved to smaller-foot Shore D gauges, resin-rich measurement locations and five-point averaging with readings at least 6.0 mm (0.24 in.) apart.

Non-Destructive Checks Favored

The team determined that destructive tensile pull-off testing could sever the continuous glass fibers that deliver hoop strength. Non-destructive impact and indentation testing better reflected the intended mechanical-protection function.

Results: A New Benchmark for Plant-Applied HDD Protection

- Demonstrated that Denso Bore-Wrap can be adapted from localized field use to full-length, large-diameter pipe protection in a plant coating environment.
- Preserved the primary 2LFBE corrosion barrier by avoiding unnecessary mechanical roughening and relying on solvent cleaning plus the topcoat anchor profile.
- Established a repeatable application model built around controlled rotation, crew sequencing, managed hydration, compression wrapping, venting and cure control.
- Generated inspection lessons specific to fiber-reinforced composite overwraps rather than applying primary-coating acceptance criteria without modification.
- Confirmed the applied structure could remain exposed to direct solar radiation and weathering elements for up to 6 months without matrix degradation, with tarpaulin sheeting reserved for extended yard storage.

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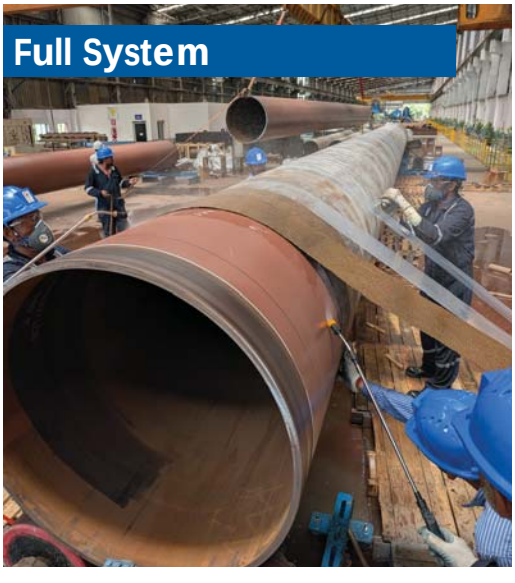
Compression Tier

Matrix Venting & Out-Feed

Full System



PROJECT IMPACT

The Anjar project showed that HDD coating protection is not only a material selection decision. It depends on the integration of surface preparation, application method, pipe-end geometry, inspection criteria, storage planning and installation-specific mechanical demands.

What is Denso Bore-Wrap®

Denso Bore-Wrap is an Abrasion Resistant Outerwrap (ARO) that has excellent performance against Shear, Abrasion, Impact, and Gouge (SAIG) forces to protect anti-corrosion coatings during pipeline installations in difficult terrain or by means of trenchless installation methods such as directional drilling, HDD, or boring. Bore-Wrap creates an abrasion-resistant, sacrificial outer laminate that protects pre-approved field joint coatings and mainline coatings such as epoxies, shrink sleeves, 3LPE, 3LPP, 2LFBE and FBE.

Project Key Performance Highlights

Key performance highlights from the use of the Denso Bore-Wrap® on this project include:

Large-Diameter HDD Protection: Bore-Wrap was applied to 914 mm (36 in.) FBE-coated pipe lengths for demanding HDD installation conditions.

Primary Coating Preserved: Surface preparation focused on solvent cleaning, helping avoid accidental thinning, gouging or damage to the 2LFBE corrosion barrier

Factory-Line Application: Mechanical pipe rotation, defined crew roles and controlled application variables made full-length wrapping practical in a plant setting.

Improved End Geometry: Single-layer factory terminations were selected to reduce excessive buildup at future girth weld overwrap areas.

Composite-Specific QC: Hardness, impact and indentation checks were tailored to the behavior of a fiber-reinforced sacrificial overwrap.

Recommendations for Future Plant-Applied Composite Overwrap Projects

- Evaluate the actual primary coating condition before requiring mechanical abrasion; avoid surface preparation steps that introduce unnecessary risk.
- Define hydration, overlap, compression, venting and cure controls in the coating procedure before production begins.
- Coordinate factory pipe-end details with the planned girth weld coating sequence and final installation geometry.
- Use inspection methods and acceptance criteria designed for composite mechanical protection, not only primary corrosion coatings.
- Address yard exposure, UV/weathering duration, support spacing, stacking, handling and contamination control in the inspection and release plan.

Company Profile

Denso, Inc. a subsidiary Winn & Coales international, specialize in the manufacture and supply of corrosion and chemical resistant coatings and linings for the long-term protection of steel, concrete and timber surfaces in the toughest corrosive environments. The company is at the forefront of innovative corrosion prevention technology, focused upon developing an extensive range of custom solutions to meet the specific needs of different industries. Our full range of products are manufactured to comply with the strict quality standards. The products are designed for longevity, with corrosion prevention solutions that can offer up to 30+ years of maintenance free service.

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