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Cover: Groundbreaking Viscotaq advances in offshore pipelay - See pages 3-5.

DENSO DIGEST

Winn & Coales International Ltd

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Denso®

WINN & COALES INTERNATIONAL

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Groundbreaking Advances in Offshore Pipelay: Denso's Viscotaq™ Offshore Field Joint Coating System

In June 2024, a Malaysia-based oil and gas exploration and production company embarked on an ambitious offshore pipelay campaign aimed at developing three offshore gas fields in Southeast Asia. Executed by a renowned global Offshore Installation Contractor (OIC), the project entailed the construction of two new sour-rated carbon steel pipelines, each equipped with risers and subsea spools. These pipelines included an 18 km run of 254mm (10") diameter pipe and a 22 km run of 304.8mm (12") diameter pipe, both designed to operate at a temperature of 109° Celsius.

Project Overview:

For this challenging project, the team selected a state-of-the-art global offshore installation DP3 pipelay barge capable of performing S-lay operations with up to 1,524mm diameter (60") pipelines. This campaign was the first time the offshore installation contractor used a cold applied field joint coating system, specifically the innovative Viscotaq™ Offshore Field Joint Coating (OFJC) system. For this project, the Viscotaq OFJC system was comprised of four layers: ViscoWrap™ XHT, Viscotaq™ PE Outerwrap, Denso™ Glass Outerwrap, and Denso Rockmesh™.

- **ViscoWrap XHT**: is comprised of a viscoelastic adhesive compound, reinforced with an HDPE mesh and backed with a PE film. It provides the corrosion protection layer of the Viscotaq OFJC system.
- **Viscotaq PE Outerwrap:** is comprised of a polyethylene tape coated with an adhesive layer. It provides circumferential compression to the corrosion protection layer of the Viscotaq OFJC system.
- **Denso Glass Outerwrap:** is comprised of a woven glass fabric, impregnated with a moisture-cured polyurethane resin. It provides mechanical protection to the Viscotaq OFJC system.
- **Denso Rockmesh:** is comprised of an extruded polymer mesh. It provides sacrificial, additional mechanical protection to the Viscotaq OFJC system during pipeline construction.

Product application training during the PQT stage.

Continued on pages 4 & 5

Further testing during the PPT stage.

Groundbreaking Advances in Offshore Pipelay...

Rigorous Testing:

The start of this successful campaign began in early 2023 with an extensive third-party testing phase. This testing was to confirm that the Viscotaq™ OFJC system met the requirements of the international standard ISO 21809-3; ultimately, it was deemed that the Viscotaq OFJC system successfully met all requirements of the standard, at a maximum service temperature of 115° Celsius. The Denso Glass Outerwrap also demonstrated outstanding abrasion resistance and excellent impact resistance.

Training and Product Qualification Tests (PQT) were conducted at one of the OIC's facilities in Kuantan, Malaysia. This demanding phase required a short total cycle time including the time allowed for the Denso Glass Outerwrap to cure to a minimum of Shore D 40. The PQT phase concluded successfully, with the OIC's applicators demonstrating their ability to apply the entire system in under 4 minutes with the Denso Glass Outerwrap achieving an average Shore D 45 hardness after a cure time of 5 minutes. The product application was so user-friendly that after just 2 hours of training, the OIC's applicators were able to start applying the Viscotaq OFJC system independently.

In addition to the PQT, the OIC required Roller Box Testing to be completed. The Viscotaq OFJC system was subjected to a 10-tonne load roller/stinger simulation. This testing was completed during the Pre-Production Test (PPT) stages at the OIC's yard. The Viscotaq OFJC system met all requirements of the Roller Box and PPT.

Seamless Project Execution and Project Completion:

The project was awarded to Winn & Coales (Denso) Ltd in collaboration with Pluperfect Technology, Denso's local Malaysian partner, at the end of 2023. Denso promptly manufactured approximately 7,000 precut ViscoWrap XHT sheets (the inner layer of the Viscotaq OFJC system) – along with the other system components – within three weeks.

By June 2024, the installation team had completed the entire FJC work onboard the OIC's pipelay vessel, finishing three days ahead of schedule and realising savings of over one million USD. A summary of all key performance highlights achieved through the use of the Viscotaq OFJC system can be found at the end of this article.

Conclusion:

This project has highlighted the advantages of the Denso Viscotaq OFJC system. This choice of system has demonstrated to both the client and the OIC that a cold-applied FJC system can be safe, efficient, robust, and effective while significantly reducing specialist equipment and manpower.

Roller box test simulating the pipelay vessel's stringer operation.

A completed FJC application ready to be placed into the sea.

...Denso's Viscotaq™ Offshore Field Joint Coating System

PROJECT SUMMARY

Product Type:
Sub Sea Splash Zone Coating

Continent:	South East Asia
Object:	Carbon steel pipelines
Problem:	Corrosion prevention
Product Solution:	Viscotaq™ Offshore Field Joint Coating System

Key performance highlights from the use of the Denso Viscotaq™ Offshore Field Joint Coating System on this project include:

- Achieving a record 1,766 hours free of Lost Time Injury (LTI) during the FJC operation.
- Averaging 200 to 290 Field Joint Coating (FJC) joints per day for the 304.8mm and the 254mm diameter pipelines respectively with a peak of 305 joints per day.
- Production application time of less than 5 minutes per joint.
- One of the lowest industry repair rates of 0.28% and 0.07% for the 304.8mm and 254mm diameter pipelines respectively. Averaging 0.19% for the entire campaign versus the KPI of 5%.
- Realising further cost savings by eliminating the need for PU infill foam on concrete weight joints.

The completed FJC once deployed into the water.

Steelcoat™ ColourTape Protects Threaded Bars on Namwater Pipeline

Denso were asked to provide a solution to protect threaded bars which are used to secure an above ground pipeline of roughly 23km which consists of 3893 pedestals and 7786 threaded round bars.

PROJECT SUMMARY

Product Type:
Coatings for Exposed Steel

Country:	Namibia
Object:	Exposed M20 threaded bars/nuts
Problem:	Corrosion prevention
Product Solution:	Denso Steelcoat™ ColourTape

The M20 threaded bar, as well as the nut, is hot-dipped galvanised however, being exposed to the elements and taking into consideration the corrosive environment surrounding Swakopmund, further protection is required.

Denso proposed and trialled the Steelcoat™ ColourTape in the presence of the client, consultant and contractor in October 2021 and, after three months of subjecting the ColourTape to the harsh environments of Namibia, it was removed from the threaded bars to reveal a corrosion-free bar.

Based on this performance, we received the order to protect all 7786 threaded bars and we have also been written into the Namwater specification.

Above ground pipe with threaded round bar and strapping securing pipe.

Steelcoat™ ColourTape applied to M20 threaded rounded bars/nuts.

Steelcoat™ & Covercoat Protection for Exposed and Buried Pipeline

A length of 500m x 300mmØ of exposed and buried pipeline in Hilton, Pietermaritzburg, required corrosion prevention.

STEELCOAT™

PROJECT SUMMARY

Product Type:
Coatings for Exposed Steel

Country:	Republic of South Africa
Object:	Exposed/buried pipeline
Problem:	Corrosion prevention
Product Solution:	Denso Steelcoat™ 500 System Denso™ Covercoat System

A combination of the Denso Steelcoat 500™ system,in conjunction with the Denso™ Covercoat system was used for the exposed pipeline and flanges. In addition Denso™ Glass Outerwrap was applied at the pipe brackets for mechanical protection.

The client also requested an on-site demonstration of Denso ViscoWrap™ ST and Denso™ PVC HD which was carried out on a 12m section of pipe.

The flanges were protected with the Denso™ Covercoat system before the application of the Denso™ Acrylic Topcoat to ensure UV stability.

Denso Viscowrap™ ST and Denso™ PVC HD applied to a length of pipe as part of a trial section.

SeaShield™ Protection for Rottnest Island's Main Jetty Sheet Pile Wall

In 2024, Denso Australia's *SeaShield 2020SP™ System was selected to provide long-term corrosion protection to the 130m length of sheet pile wall located in the main jetty of Wadjemup/ Rottnest Island. The Main Jetty is Rottnest Island's largest maritime service structure, with the barge ramp being used for daily cargo operations to and from the mainland located at the base of the jetty. In addition, the jetty is the main arterial point of entry for island visitors and marks the place where they commence their Rottnest Island experience as they disembark from ferries. It is also the sole entry and exit point for ferry operators while the barge ramp is used for commercial deliveries.

Above & Top: Rottnest Island's Main Jetty.

Below: Sheet pile wall before the SeaShield application.

PROJECT SUMMARY

Product Type:
Sub Sea Splash Zone Coating

Country:	Australia
Object:	Sheet pile wall
Problem:	Corrosion prevention
Product Solution:	*SeaShield™ 2020SP System

The Selected SeaShield System:

The sheet pile wall on Rottnest Island was constructed in stages beginning in the 1960s and has suffered severe corrosion in the splash zone over that time. The *SeaShield 2020SP™ System was selected to prevent further corrosion and provide a life extension to the structure.

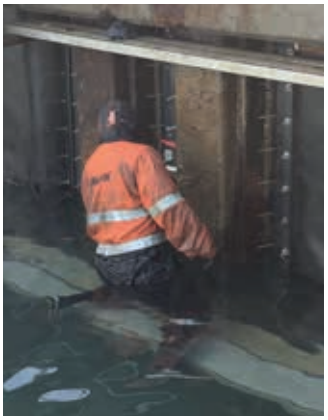
Offering a comprehensive, long-term corrosion protection solution would require us to accommodate for tie-back points as well as varying heights along the length of the wall, a challenge the *2020SP system takes in its stride.

The system was applied both above and below the water line and this allowed applicators to continue the works under tight timelines and unfavourable tides to get the project completed prior to the busy summer season.

**The SeaShield 2020SP™ system is only currently available from Denso Australia.*

Wall attachment spine.

View of welded bars.



Application of SeaShield Primer.

Application of Marine Piling Tape.

Application of Foam Filler.

Installation of HDPE Jackets.

Minimal Surface Preparation Required:

A 3D scan of the sheet pile configuration was completed at the beginning of June 2024. The project contractor, Advanteering Civil Engineers were then mobilised to tackle the surface preparation of the substrate.

The removal of all loose corrosion and marine growth was achieved using a hull scrubber and a 5000 PSI water jetter. Since the SeaShield systems easily fill and protect deeply pitted steel, the surface preparation was far simpler than for other methods, and the effectiveness of SeaShield systems to halt future corrosion meant the need for repair plates to repair corroded sections was avoided.

Special thanks to our project contractor, Advanteering Civil Engineers.

Sheet pile wall with completed SeaShield application.

Another Successful 'Denso Training Day'

A site visit was recently carried out by a Denso Technical Area Sales Manager to a major UAE Water and Electricity Utility company, to provide product application training for its contractors. This training session was the result of a team effort with Denso's agent in the region, Bin Moosa & Daly Ltd.

PROJECT SUMMARY

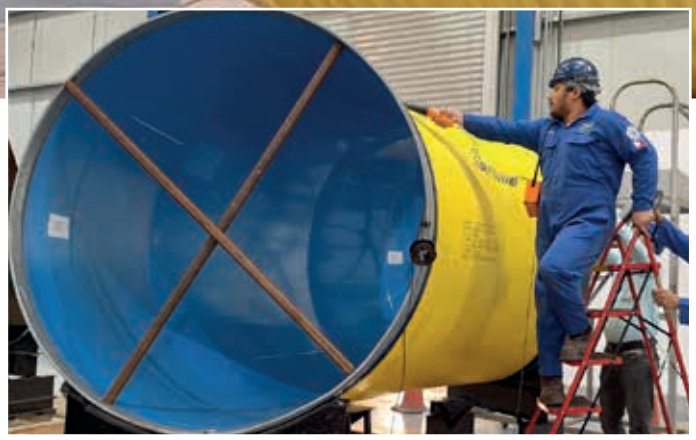
Product Type:
Coatings for Buried Steel

Country:	United Arab Emirates
Object:	Training course for coating pipeline
Problem:	Corrosion prevention
Product Solution:	Densopol 80HT™ System

Denso usually provide product application training as a free service and always highly recommend it for new contractors and our customers' maintenance staff etc.

In this specific instance the training covered the long-term protection of below ground buried DN1,400 to DN1,800mm diameter FBE coated carbon steel pipe fittings with a maximum peak operating temperature of 75°C. The Denso products demonstrated were Primer D, Densopol 80HT Tape and Denso PVC SA 200 Yellow Tape.

After priming with Denso Primer D, the initial wrap of Densopol 80HT is applied.



Above: Checking the completed outerwrap coating for holidays.

Above: A good example of a 50% overlapped tape wrap of Denso PVC SA 200 Tape, giving a double layer of outerwrap protection.

Knowing how to apply Denso products correctly is essential to get the longest available service life out of them and product training achieves this skill, as you can see from the photos on these pages.

Another group of confident Denso product applicators emerged at the end of this training session (see below) all thanks to our highly skilled Denso Area Sales Manager for the region, Mr Chris Todd.

Viscotaq™ Coating Rehabilitation for Enhanced Durability in Mexico's Natural Gas Network

The rehabilitation of the coating systems on two critical gas pipelines in northern Mexico addressed essential needs for durability, safety, and corrosion protection within the region's natural gas infrastructure. Located approximately 80 miles outside Monterrey, Nuevo León, the 42" Gas Pipeline, known as "Los Ramones," and the 36" Gas Pipeline, connecting "Estación 19" to "Los Ramones," underwent extensive coating restoration from September 2023 to September 2024. This initiative was crucial in maintaining the long-term operational integrity of both pipelines, given their roles in transporting natural gas across Mexico.

Removal of coal tar coating prior to installation of ViscoWrap™ HT.

The rehabilitation work involved the application of advanced coating solutions designed to withstand Mexico's demanding environmental conditions. The coating system used included ViscoWrap™ HT (12" x 33') with an outer layer of Viscotaq™ Outerwrap PE (6" x 100'), a configuration selected for its robust corrosion protection capabilities. On suitably prepared surfaces the unique visco-elastic properties of ViscoWrap HT allow it to bond rapidly to substrates without priming, offering exceptional resilience against corrosion without the need for primer or abrasive blast cleaning to a high standard. Additionally, its self-healing nature makes it resistant to harsh soil conditions, ensuring the pipelines are better protected against potential damage and corrosion in the future. The result is a durable, low-maintenance solution that reduces operational costs while enhancing pipeline safety and longevity.

ViscoWrap is an excellent coating in providing corrosion protection for underground pipelines with minimal surface prep.

42" diameter gas pipeline being wrapped with ViscoWrap HT for rehabilitation

Throughout the year-long project period, a total of 8,891 feet (2,710 meters) of the 36" gas pipeline was coated, covering approximately 83,829 square feet (7,788 square meters), while 23,687 feet (7,220 meters) of the 42" gas pipeline received coating over a surface area of approximately 260,600 square feet (24,211 square meters). This extensive application provides long-term protection against degradation, preserving the pipelines' structural integrity and reducing the need for future maintenance.

Viscotaq Outerwrap PE provides mechanical protection and aids in self-healing properties of ViscoWrap.

PROJECT SUMMARY

Product Type:
Coatings for Buried Steel

Country:	Mexico
Object:	42" Gas pipeline
Problem:	Corrosion prevention
Product Solution:	ViscoWrap™ HT and Viscotaq™ Outerwrap PE

The successful completion of this project was made possible through a strong partnership between CENAGAS, the owner of the pipelines, and G.A. Energy Services, the contractor tasked with executing the rehabilitation work. This collaboration highlights the importance of proactive maintenance in critical infrastructure projects, especially within Mexico's natural gas supply network, where reliability and safety are paramount. By extending the operational life of these pipelines, the project supports Mexico's energy infrastructure and ensures a stable and safe gas supply for the future.

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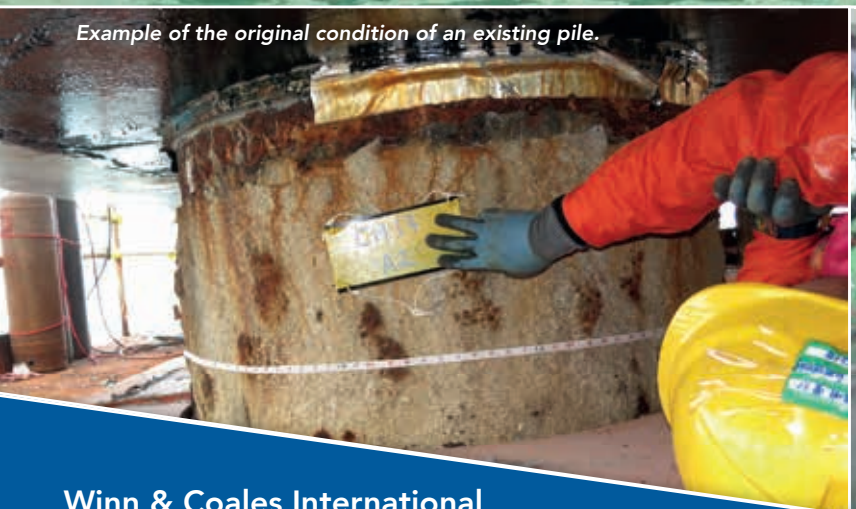
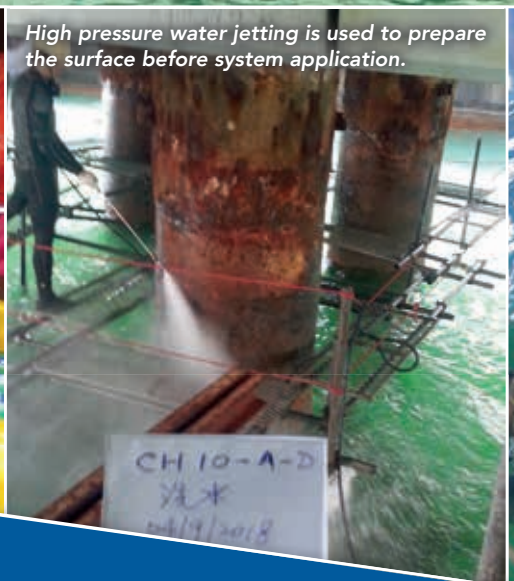
The Avenue of the Stars gets SeaShield™ Pile Protection

The Avenue of Stars (background picture) – styled upon the Hollywood Walk of Fame – is one of Hong Kong's most iconic tourist destinations. The promenade wraps around Tsim Sha Sui's southern border and provides stunning views of the Hong Kong skyline across Victoria Harbour.

SeaShield™



Example of the original condition of an existing pile.



High pressure water jetting is used to prepare the surface before system application.

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PROJECT SUMMARY

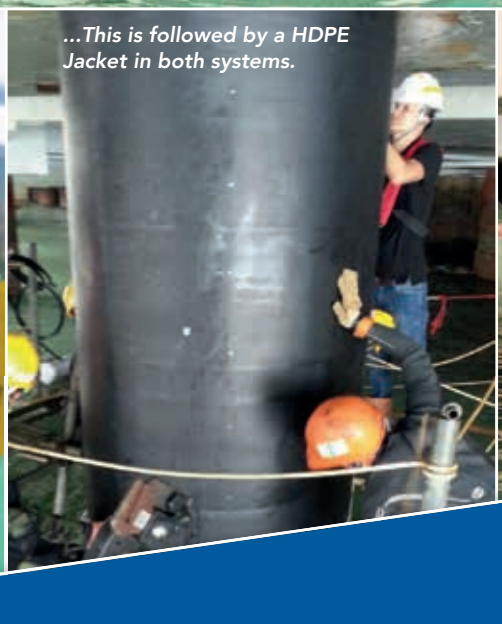
Product Type:
Sub Sea Splash Zone Coating

Country:	Hong Kong
Object:	Steel jetty piles
Problem:	Corrosion prevention
Product Solution:	SeaShield™ 100 & 2000FD Systems

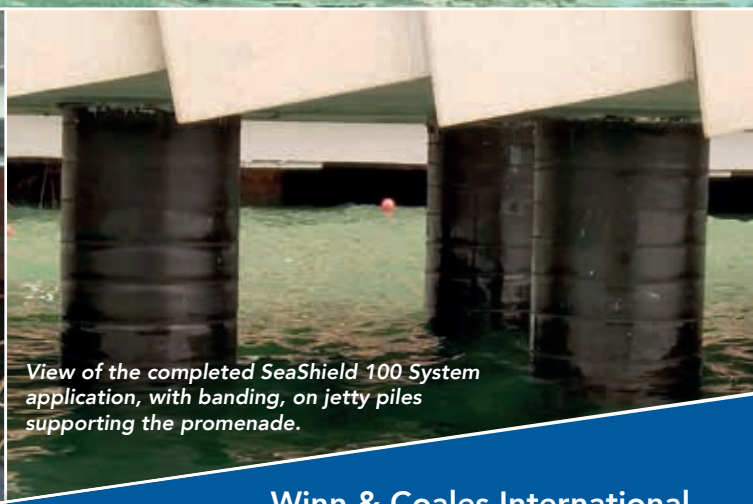
During a period of redevelopment, the SeaShield 100™ System was applied to 93 jetty piles that were each 1150mm in diameter. In addition to this, the SeaShield 2000FD™ System was applied to protect a further 16 piles of 2000mm diameter each. Both systems can be applied above and below water and offer robust protection to jetty piles that are exposed to the corrosive conditions found in splash zone, inter-tidal and subsea environments.

Work to protect the existing jetty piles was completed in 2018. The avenue reopened to the public in 2019.

Denso Marine Piling Tape is the primary corrosion prevention layer...



...This is followed by a HDPE Jacket in both systems.



View of the completed SeaShield 100 System application, with banding, on jetty piles supporting the promenade.

If you would like more information about our long-term corrosion prevention and sealing systems that deal with the problem areas listed below, simply tick the boxes and send us back this completed page and we will supply you with more information.

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- ☐ Protection of mounded LPG vessels and fuel tanks.

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- ☐ Corrosion prevention for metal roof purlins and metal roof sheets.
- ☐ Protecting pre-stressing and post tensioning bridge cables and ground anchorages.

SUBSEA & SPLASH ZONE COATINGS

- ☐ Maintenance corrosion protection for steel jetty piles.
- ☐ Subsea pipelines and outfalls.
- ☐ Protection of timber and concrete piling.

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DIY WEATHERPROOFING

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