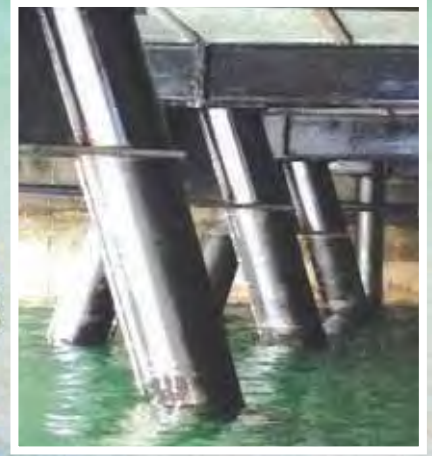




SPECIAL EDITION LOOKING
BACK OVER SEASHIELD™
CASE HISTORIES FROM THE
DENSO DIGEST DURING
2010 - 2020



DENSO DIGEST

Winn & Coales International Ltd

Volume 36, Number 1

Denso®



1929 - 2019

WINN & COALES INTERNATIONAL

For further information on our products and their suitability for your particular project, please contact any of the Denso companies listed below:

WINN & COALES (DENSO) LTD

✓ Corrosion prevention and sealing systems

Denso House, Chapel Road, London SE27 0TR, England

Tel: +44 (0) 20 8670 7511

Email: mail@denso.net

Website: www.denso.net



PREMIER COATINGS LTD

✓ Membranes and corrosion prevention systems

Headcorn Road, Smarden, near Ashford, Kent TN27 8PJ, England

Tel: +44 (0) 1233 770663

Email: enquiries@premiercoatings.com

Website: www.premiercoatings.com



ARCHCO

✓ Corrosion resistant linings

Denso House, Chapel Road, London SE27 0TR, England

Tel: +44 (0) 20 8761 6244

Email: mail@denso.net

Website: www.denso.net



DENSO NORTH AMERICA INC - CANADA

✓ Corrosion prevention and sealing systems

90 Ironside Crescent, Unit 12, Toronto, Ontario, M1X 1M3 Canada

Tel: +1 416 291 3435

Email: sales@densona-ca.com

Web site: www.densona.com



DENSO USA - LP

✓ Corrosion prevention and sealing systems

9710 Telge Road, Houston, Texas 77095 United States of America

Tel: +1 281 821 3355

Email: info@densona.com

Website: www.densona.com



DENSO SOUTH AFRICA (PTY) LTD

✓ Corrosion prevention and sealing systems

120 Malacca Road, Redhill Industrial Area, Durban North 4051 Republic of South Africa

Tel: +27 31 569 4319

Email: bid@denso.co.za

Website: www.denso.co.za



DENSO (AUSTRALIA) PTY LTD

✓ Corrosion prevention and sealing systems

77-95 National Boulevard Campbellfield, Victoria 3061, Australia

Tel: +61 1300 658 590

Email: denso@densoaustralia.com.au

Website: www.densoaustralia.com.au



DENSO (NEW ZEALAND) LTD

✓ Corrosion prevention and sealing systems

PO Box 76167, Manakau City, Auckland New Zealand

Tel: +64 9274 1255

Email: info@denso.co.nz

Website: www.densoaustralia.com.au



SEASHIELD INTERNATIONAL

✓ Marine corrosion protection systems

Denso House, Chapel Road, London SE27 0TR, England

Tel: +44 (0) 20 8670 7511

Email: mail@denso.net

Website: www.denso.net



SEASHIELD INTERNATIONAL

✓ Marine corrosion protection systems

9710 Telge Road, Houston, Texas 77095 United States of America

Tel: +1 281 821 3355

Email: houston@densona.com

Website: www.densona.com



SEASHIELD INTERNATIONAL

✓ Marine corrosion protection systems

77-95 National Boulevard, Campbellfield, Victoria 3061, Australia

Tel: +61 1300 658 590

Email: denso@densoaustralia.com.au

Website: www.densoaustralia.com.au



SEASHIELD INTERNATIONAL

✓ Marine corrosion protection systems

PO Box 76167, Manakau City, Auckland, New Zealand

Tel: +64 9274 1255

Email: info@denso.co.nz

Website: www.densoaustralia.com.au



CONTENTS

- 4 SeaShield™ Systems Protect Manx Outfall Pipe
- 5 SeaShield 400™ & SeaShield 70™ Protection for Timber Piles
- 6 SeaShield 500™ System Protects Historic Yellowstone Bridge
- 7 Port of Seattle Piers Protected with SeaShield 2000HD™ System
- 8 City of Juneau H-Piles Protected with SeaShield 2000HD™ System
- 9 City of Ketchikan Cruise Ship Dock: 10 Years with SeaShield™
- 10 SeaShield™ Protects Steel Piles and Cross Beams
- 11 SeaShield™ Protects Western Isles Bridge Piles
- 12 SeaShield™ Protection for Bulk Export Port Wharf Piles
- 13 SeaShield™ Protection for BlueScope Wharf Piles
- 14 SeaShield 2000FD™ Protects the GSPC LNG Jetty
- 15 SeaShield™ System Protects Piles in Qatar Holiday Island Resort



A selection of case histories from 2010 to 2020

Welcome to this issue of the Denso Digest which takes another look at a selection of SeaShield™ case history applications from around the world that have featured in previous Denso Digest issues, published during the last 10 years.

Our SeaShield protective systems for marine piles, risers etc were first introduced in Australia in 1972 and have gained a reputation for reliability and effectiveness over the years since then. They have been used all over the world, sometimes in the most challenging of marine environments making them one of the most popular range of marine protection systems available today.

The SeaShield systems are designed to protect the vulnerable splash zone area of jetty piles against corrosion. Our current and most comprehensive range of systems, are the culmination of 48 years of experience in providing long-term protection against one of the most aggressive corrosive environments in existence.



SeaShield™ Systems Protect Manx Outfall

When Manx Utilities in the Isle of Man wanted to install a new sea outfall pipe to discharge foul effluent at Kirk Michael, they appointed Hyder Consulting to advise on the new pipe installation. The engineers at Hyder Consulting asked Denso for advice on a suitable coating system to protect the pipe joints from corrosion.

The Denso SeaShield 80 System comprises Denso S105 Paste™, followed by Denso Marine Piling Tape™ overwrapped with Densoclad 70™ Tape or Densopol 80™ Tape. The combination with the Denso SeaShield 70 System means that on top of the Denso SeaShield 80 System there is an additional wrap of Denso Glass Outerwrap 70™, a flexible fibreglass cloth impregnated with a water activated resin, that provides excellent abrasion and impact resistance.

Because the location for the new sea outfall was very exposed, Denso recommended using a combination of the Denso SeaShield 80™ System and Denso SeaShield 70™ System to provide extra protection against the severe environmental conditions.

JCK Ltd from Ballasalla, Isle of Man was the contractor chosen to apply the system and Denso gave the appropriate application guidance to the contractor when it was needed. The successful work was overseen by Homes Grace Consulting Engineers, Hydra Consulting and Manx Utilities.

Completed Seashield pipe joint protection.



PROJECT SUMMARY

Product type:
Sub Sea Splash Zone Coating

Country:	United Kingdom
Object:	Outfall pipe
Problem:	Corrosion prevention
Product	SeaShield 70™ &
Solution:	SeaShield 80™ Systems



SeaShield 400™ & SeaShield 70™ Protection for Timber Piles



A local Victorian maritime consultant specified the use of Denso's SeaShield™ Marine Systems for the refurbishment of Appleton Dock Wharf in the Port of Melbourne.



View of the timber piles beneath the Appleton Dock.

PROJECT SUMMARY

Product type:
Sub Sea Splash Zone Coating

Country:	Australia
Object:	Timber jetty piles
Problem:	Timber deterioration
Product Solution:	SeaShield 400™ & SeaShield 70™ Systems

Following a request for tenders, the Port of Melbourne Corporation awarded the contract for material supply, and the SeaShield Series 70™ preventative wraps and SeaShield Series 400™ strengthening system were installed over a six month period from January to June 2019.

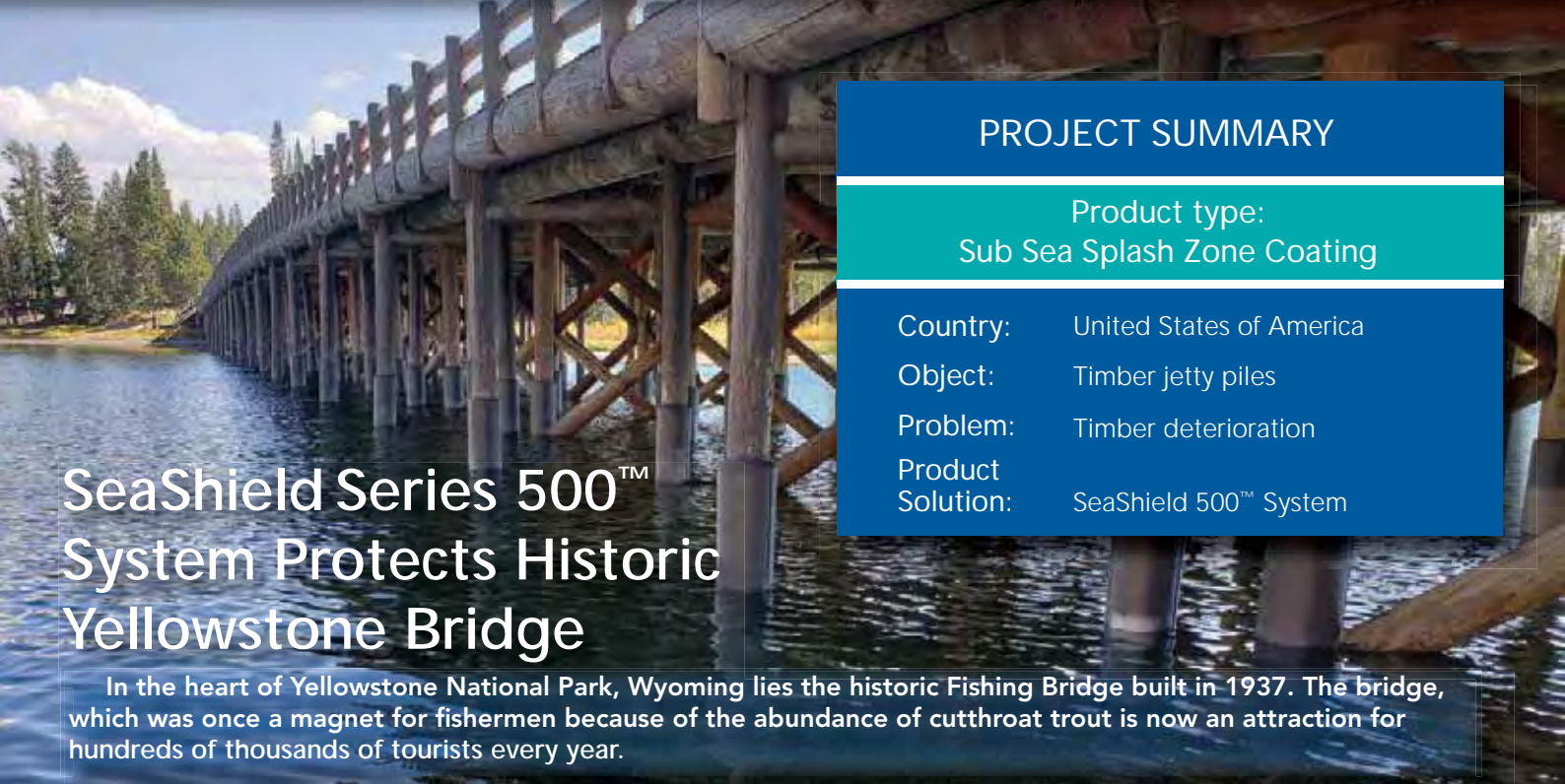
With the continuous operation of general cargo ships, the installation proved no easy feat but MMA Offshore (ex Neptune Marine Services) and Freyssinet, who were engaged by the Port of Melbourne to undertake the installation were able to deliver a successful project on time.

The Denso SeaShield™ systems will provide preservation and restoration to new and old piles well into the future.

The SeaShield 400™ System comprises a Fibre Form™ Jacket filled with Denso 510™ Grout.

An outerwrap of Denso Glass Outerwrap 70™ completes the SeaShield 70 System.





SeaShield Series 500™ System Protects Historic Yellowstone Bridge

In the heart of Yellowstone National Park, Wyoming lies the historic Fishing Bridge built in 1937. The bridge, which was once a magnet for fishermen because of the abundance of cutthroat trout is now an attraction for hundreds of thousands of tourists every year.

PROJECT SUMMARY

Product type:
Sub Sea Splash Zone Coating

Country:	United States of America
Object:	Timber jetty piles
Problem:	Timber deterioration
Product Solution:	SeaShield 500™ System



Contractor preparing deteriorated timber piles for the installation of Denso's SeaShield Series 500™ Fiber Glass Jacket System

The bridge structure is supported by 162 x 15" diameter timber piles that have deteriorated over time in the water line to mud line area and were in need of protection to prevent further damage.

For an effective solution the SeaShield Series 500™ System was selected as the system to completely encapsulate the vulnerable area of all 162 piles using 17" dia. SeaShield Fiber-Form™ jackets that yielded a minimum 1/2" annular space. The jackets were constructed 3/16" thick and in a special brown color to closely match the existing piles. The annulus was then filled with the SeaShield 550 Epoxy Grout™. The epoxy grout kits consisted of 3 gallons of 2-part epoxy and 2.5 x 50 lb. bags of Part C Aggregate yielding 1.2 cu ft per kit. The epoxy grout, due to its outstanding flow

characteristics, effectively filled all voids, cracks and checks in the piles. Finally, the tops of the jackets were sealed off using a special brown color SeaShield SplashZone UW Epoxy™.

The total project comprised 1,440 LF of 17" dia. SeaShield Fiber-Form Jackets and 575 kits of the SeaShield 550 Epoxy Grout. Installation took place during the late summer of 2018 and was completed 2 weeks ahead of schedule. The contractor was very pleased with the easy installation of both the Fiber-Form Jackets and the 550 Epoxy Grout.

The Series 500 System provides excellent compressive, flexural and tensile strength, as well as outstanding bond strength to the timber piles. The system also provides weathering protection, with excellent abrasion and UV resistance to ensure a long service life protecting the historic Yellowstone Fishing Bridge.

Timber piles fully protected using the SeaShield Series 500™ System from weathering and deterioration.



Port of Seattle Piers Protected with SeaShield Series 2000HD™ System



In 2013, The Port of Seattle was named as the 14th largest port in North America after handling over two million containers (TEUs) and one million cruise ship passengers. The pressure placed on the growing port over the preceding years had led to the pier support piles requiring installation of a long-term, splash-zone corrosion prevention system.

As a solution, a trial project to protect 40 piles on piers 66 & 69 with Denso's SeaShield Series 2000HD™ System was started in 2008. After performing appropriate surface preparation to the pile's splash-zone area, Denso S105 Paste™ was applied followed by Densyl™ Tape with a 55% overlap. Finally, Series 2000HD Jackets (80mil HDPE) were fixed in place to complete the system.

Three years of monitoring later, the port's maintenance and engineering groups declared that the SeaShield system had protected the piles as advertised, so the pleased Port of Seattle authorities decided to protect the remaining 501 piles on piers 66 and 69 with the same SeaShield system.

The project was put out to tender in 2013 and was awarded to KC Construction who completed it in early 2014 leaving the Port of Seattle standing strong as a major North American distribution and travel terminal for decades to come.

Opposite: Completed piles fully protected with the SeaShield Series 2000HD™ System



Installation of Denso S105 Paste™ and Densyl™ Tape to a 24" steel pile.



Installing the 80 mil HDPE outercover with M10 316SS fasteners

PROJECT SUMMARY

Product type:
Sub Sea Splash Zone Coating

Country: United States of America
 Object: Steel jetty piles
 Problem: Corrosion prevention
 Product Solution: SeaShield 2000HD™ System





City of Juneau Waterfront H-Piles Protected with the SeaShield Series 2000HD™ System

Recent improvements had been made to the downtown waterfront area of the City of Juneau. The changes included modifications to The Cruise Ship Terminal and associated dock area containing the restaurants and shops that cater for the many tourists who visit. As a part of the improvements, Denso's SeaShield Series 2000HD™ System was chosen to protect 79 H-Piles that were showing corrosion in the splash zone area.

View of Downtown Juneau, Alaska.



PROJECT SUMMARY

Product type:
Sub Sea Splash Zone Coating

Country: United States of America

Object: Steel jetty piles

Problem: Corrosion prevention

Product Solution: SeaShield 2000HD™ System

Power tool surface preparation cleaning was first performed by the Dive Contractor before applying Denso S105 Paste™. Then foam blocks wrapped with Densyl™ Tape were applied to the surface with an additional wrap of Densyl Tape before the SeaShield 2000HD™ Jackets (80mil HDPE) were fixed into place. There were also several piles that had cross bracing and node areas, and these were wrapped with the conformable Denso Glass Outerwrap 70™. SeaShield SZ Underwater Epoxy™ was used to protect all other irregular gusset areas that could not be wrapped.



Completed H-Piles fully protected with the SeaShield Series 2000HD System.

The SeaShield system offers 20+ years protection in this harsh environment that gets over 20 feet of tidal fluctuation. The project was completed in the early Spring of 2016 under budget and ahead of schedule and all parties including the contractor, design engineer and City of Juneau authorities were very pleased with the result.

Below: Pile cap/gusset area protected with the SeaShield SZ Underwater Epoxy™.



Below: Steel cross beams protected with Denso Glass Outerwrap 70™ in lieu of the 80 mil HDPE Outercovers.





City of Ketchikan Cruise Ship Dock: 10 Years with the SeaShield Series 2000HD™ System

The Cruise Ship Passenger Terminal Dock in Ketchikan, Southern Alaska underwent some improvements in early 2007. Part of the improvements involved protecting the steel piles with a long-term, splash-zone corrosion prevention system.

The Denso SeaShield Series 2000HD™ System was chosen for the project and the contractor started the installation on the piles by using the required surface preparation method. A coating of Denso S105 Paste™ was then applied followed by an overwrap of Densyl™ Tape with a 55% overlap. Finally, the SeaShield 2000HD Jackets were fitted, completing the installation.

PROJECT SUMMARY	
Product type: Sub Sea Splash Zone Coating	
Country:	United States of America
Object:	Steel jetty piles
Problem:	Corrosion prevention
Product Solution:	SeaShield 2000HD™ System



An inspection carried out 10 years later, on a selection of piles to check their condition by removal of the Jackets and Densyl Tape wrapping, showed the system had performed very well and the piles showed no corrosion underneath. A great example of how the SeaShield 2000HD System continues to give long-term protection.

Completed piles fully protected with the SeaShield Series 2000HD™ System in 2007.



SeaShield protected pile inspected and showing no corrosion after 10 years service.



SeaShield™ Protects Steel Piles and Cross Beams

Tensioning the SeaShield Jacket fixings.



Shearwater Marine Services were awarded the contract for installing protection to the steel Jetty Piles at Ullapool Harbour for The Ullapool Harbour Trust. Consulting Engineers Wallace Stone specified the use of SeaShield Systems supplied by Winn and Coales (Denso) Ltd.

Shearwater Marine Services installed a combination of the SeaShield 2000FD™ and SeaShield 70™ Systems to the piles and various supporting cross beams on the structure. The SeaShield Systems have an extensive history of providing long term corrosion protection to marine structures.

SeaShield 2000FD consists of Denso S105 Paste™, Denso Marine Piling Tape™ and Denso SeaShield Jackets™, which are hydraulically tensioned before being secured with Stainless Steel Fixings.

The completed Seashield 2000FD™ System on piles in the background and the SeaShield 70™ protected cross beams in the foreground.



PROJECT SUMMARY

Product type:
Sub Sea Splash Zone Coating

Country: United Kingdom
Object: Jetty piles and cross beams
Problem: Corrosion prevention
Product: SeaShield 70™ and SeaShield 2000FD™ Systems
Solution: SeaShield 70™ and SeaShield 2000FD™ Systems

The SeaShield 70 System was used on the cross beams and is an excellent option on areas where the piles have obstructions. This system consists of Denso S105 Paste, Denso™ Profiling Mastic, Denso™ Marine Piling Tape and Denso SeaShield Glass Outerwrap 70™.

Wrapping the jetty piles and beams with Denso Marine Piling Tape.



SeaShield™ Protects Western Isles Bridge Piles



PROJECT SUMMARY	
Product type: Sub Sea Splash Zone Coating	
Country:	United Kingdom
Object:	Steel jetty piles
Problem:	Corrosion prevention
Product Solution:	SeaShield 2000FD™ System

The completed application of the Seashield 2000FD™ System.

When six piles on the Eriskay Causeway Bridge in the Western Isles, needed a protective system applied to them, Aberdeen Marine Ltd who were awarded the contract, suggested using the Winn & Coales (Denso) Ltd, SeaShield 2000FD™ System as an alternative to the originally specified system for the project.

After studying the technical merits and benefits of using the SeaShield system, the Western Isles Council agreed to change the specification and the work was given the go-ahead. Although the inclement weather and remote location was a challenge, Aberdeen Marine

completed the system installation over the winter months.

SeaShield 2000FD™ is a heavy duty robust system which provides protection against corrosion on marine piles. It consists of Denso S105 Paste™, Denso™ Marine Piling Tape and an HDPE Jacket which is applied by hydraulic tensioning equipment and secured with stainless steel bolts.

SeaShield™ Protection for Bulk Export Port Wharf Piles

The Port of Dampier in Western Australia is one of Australia's largest bulk export ports, exporting iron ore, salt, liquefied natural gas, anhydrous ammonia as well as project cargo, break bulk and general cargo. The Port, located approximately 1,550 kilometres north of Perth on the west Pilbara's Burrup Peninsula, has more than 120ha of land area and 650 km² of marine waters. Its network extends 350 kilometres inland to the iron ore deposits of the Pilbara region and 200 kilometres seaward to the oil and gas field of the North West Shelf.

View underneath the MOF Wharf showing the SeaShield 2000FD™ system applied to the steel piles.

Due to NW Western Australia's extreme marine environment, steel piles on the MOF Wharf at the port needed attention due to the original marine grade epoxy coating protection prematurely breaking down.

The client wanted a 25 year maintenance free solution that could be verified through case histories and independent testing so Denso Australia put forward their SeaShield 2000FD™ system for comparison against other pile protection systems that were currently available in the marketplace.

The SeaShield 2000FD system was chosen for the project because of its long-term case history evidence, verifiable product data, ease of application, continuous jacket tension and an expected service life of 25+ years. Now in its 13th year of service the SeaShield

The busy MOF Wharf.

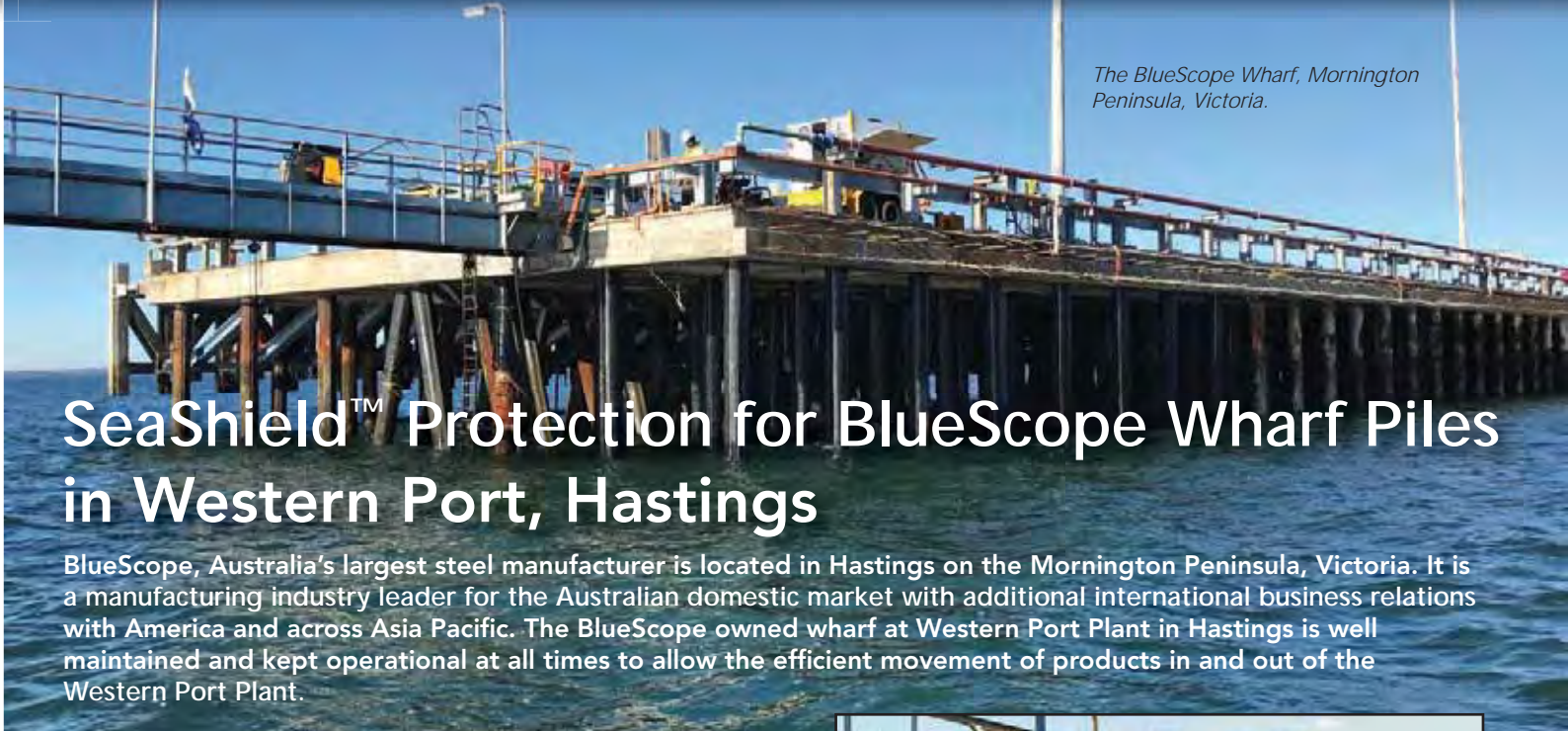


PROJECT SUMMARY	
Product type: Sub Sea Splash Zone Coating	
Country:	Australia
Object:	Steel jetty piles
Problem:	Corrosion prevention
Product Solution:	SeaShield 2000FD™ System

2000FD system remains intact withstanding multiple cyclones and the severe seas that accompany these destructive storms.

Application of the SeaShield 2000FD™ Jackets.





The BlueScope Wharf, Mornington Peninsula, Victoria.

SeaShield™ Protection for BlueScope Wharf Piles in Western Port, Hastings

BlueScope, Australia's largest steel manufacturer is located in Hastings on the Mornington Peninsula, Victoria. It is a manufacturing industry leader for the Australian domestic market with additional international business relations with America and across Asia Pacific. The BlueScope owned wharf at Western Port Plant in Hastings is well maintained and kept operational at all times to allow the efficient movement of products in and out of the Western Port Plant.

An ongoing maintenance plan at the BlueScope owned wharf has been the progressive installation of the Denso SeaShield 2000FD™ system to protect the HP2 Octagonal Steel piles. To date, Denso have manufactured and supplied hundreds of the SeaShield 2000FD Jackets for the stages of maintenance work undertaken. Engineers at BlueScope chose the Denso SeaShield protection system because of its durable nature and aesthetic appeal.

View underneath the BlueScope Wharf showing the installation of the SeaShield 2000FD™ system to the steel piles.



PROJECT SUMMARY

Product type:
Sub Sea Splash Zone Coating

- Country: Australia
- Object: Wharf piles
- Problem: Corrosion prevention
- Product Solution: SeaShield 2000FD™ System

SeaShield 2000FD™ Protects the GSPC LNG Jetty



PROJECT SUMMARY

Product type:
Sub Sea Splash Zone Coating

Country:	India
Object:	Steel jetty piles
Problem:	Corrosion prevention
Product	
Solution:	SeaShield 2000FD™ System

When a new LNG Jetty was installed in Mundra, India, some of the support piles needed protection in the splash-zone area. The Jetty owner GSPC LNG, a joint venture of Gujarat State Petroleum Corp and Adani Enterprises, considered many options for protecting the piles. The project was further complicated by several challenges including rough seas, long piles, a small working time window, costs considerations and the need for rapid installation.

After consultation between GSPC, Adani and Simplex, the Denso SeaShield 2000FD™ System was finally chosen as the product solution that meets their requirements. The SeaShield system scored highly against its competitors due to its ease of use, in-situ application and minimum requirements for surface preparation.

Denso™ Marine Piling Tape is spirally applied before the SeaShield Jackets are put into position and hydraulically closed.



Extra splash zone protection supplied by SeaShield 2000FD™ system.



SeaShield™ System Protects Marine Piles in Qatar Holiday Island Resort



Holiday villas at the Antara Doha Island Resort, off Doha Bay, Qatar are built upon marine piles which are subject to tidal activity. All of the piles at this site required corrosion protection so it was decided to install the Denso SeaShield 2000FD™ System to the lower pile area.

PROJECT SUMMARY	
Product type: Sub Sea Splash Zone Coating	
Country:	Qatar
Object:	Steel jetty piles
Problem:	Corrosion prevention
Product Solution:	SeaShield 2000FD™ System

First all loose material and marine growth was removed by mechanical cleaning methods from the area before the SeaShield system was applied comprising a wrap of Denso™ Marine Piling Tape at 55% overlap followed by the installation of the SeaShield 2000FD Jackets to complete the system. The SeaShield 2000FD System has now been in successful service for six plus years.

Below left: Denso Marine Piling Tape is applied to the previously cleaned pile surface.

Below: The protective Jackets are applied completing the SeaShield 2000 FD system.



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.

BURIED ONSHORE COATINGS

- External corrosion prevention for underground pipelines, welded joints, valves and fittings.
- Protection of mounded LPG vessels and fuel tanks.

EXPOSED SURFACE COATINGS

- Corrosion prevention for chemical plant, structural steelwork, above ground pipes, storage tanks, offshore rigs, bridges and support cables, cranes and pipe bridges.
- 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.

INDUSTRIAL LININGS

- Internal linings for tanks, pumps, vessels and pipelines.
- Linings for concrete bunds and floors.
- External abrasive wear protection.

MEMBRANES AND FLASHINGS

- Tanking / waterproofing.
- Exposed rooftops and parapets.

SEALING MASTICS

- Joint sealing of precast concrete manholes and culverts.
- Joint and crack sealing of asphalt road surface wearing courses.
- Joint sealing for airport runways.
- Sealing of cable entry ducts.

INDUSTRIAL TAPES

- Sealing and insulating.
- Protecting and bonding.

DIY WEATHERPROOFING

- Waterproofing and flashing.

For further information - tick boxes, fill in coupon and email or post to your nearest Denso branch (full list of addresses on page 2)

Name: Title:

Company:

Address:

Phone: Email:

UK: mail@denso.net ● USA: houston@densona.com ● CANADA: sales@densona-ca.com

AUSTRALIA: denso@densoaustralia.com.au ● NEW ZEALAND: info@denso.co.nz ● SOUTH AFRICA: bid@denso.co.za



WINN & COALES INTERNATIONAL LTD

TEL: +44 (0) 208 670 7511 33 - 35 Chapel Road
 EMAIL: mail@denso.net London
 WEB: www.denso.net SE27 0TR
 UNITED KINGDOM

