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Denso® Digest

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This issue of the Denso Digest contains another collection of recent application stories from around the world. Please contact your local Denso company for more advice or product information or fax/mail the form on the back of this publication.

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To enable quick identification of the subject matter within each story in this brochure we have adopted the following colour codes.

PROJECTS INVOLVING:

PROTECTIVE COATINGS FOR.....
- BURIED PIPELINES & LPG VESSELS
- EXPOSED STEEL & PIPEWORK
- SUB SEA PIPELINES & JETTY PILES

PROTECTIVE LININGS FOR.....
- STORAGE TANKS, PUMPS ECT

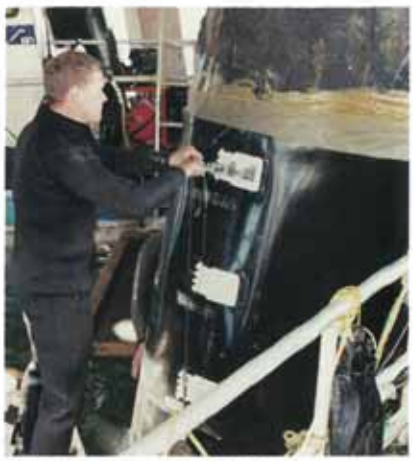
SEALING & WATERPROOFING.....
- SEALING MASTICS
- MEMBRANES & FLASHINGS
- INDUSTRIAL TAPES

Corrosion Prevention - Jetty Piles / Splash Zone

The Arco Pipeline Dock.

SeaShield Series 2000 System Protects Pipeline Company's Dock

Arco Pipeline's Dock located in Freeport, Texas is constantly subjected to the most highly corrosive elements. The salt water of Texas's Gulf Coast combined with an average year-round humidity of 90% was taking its toll on the steel piles that support the dock. After many years of failed coatings, the SeaShield Series 2000 System was selected due to the long-life protection it offered and the ease of installation.



Application of the SeaShield 2000 System.

The project involved the splash zone protection (8 feet) of 80, 42" diameter steel piles. First, the piles were cleaned properly by removing all existing marine growth and rust. Next, the Denso Paste S105 was applied over the entire surface to be coated. Then, the SeaShield Marine Tape was applied spirally with a 55% overlap, starting from the bottom and proceeding upward. Finally the SeaShield Series 2000 Outercover, made of 80 mil HDPE and custom fabricated to exact size, was secured around the piles. The unique locking system, made of HDPE buckles, were extrusion welded to the vertical length of the HDPE Outercover, creating a one-piece system that does not require the use of straps. The buckles are simply snapped together and tightened with a tensioning tool.

There are many benefits inherent to the Series 2000 System. First of all, installation time can be reduced by 33% or more by not having to install a timely strapping system to secure the outercover. Secondly, without metal straps and buckles, the finished product is more aesthetically pleasing. Most important, the steel piles receive a long service life without corrosion.

The completed SeaShield system in service.

Corrosion Prevention - Buried Pipelines

Food Industry Requires Denso Corrosion Prevention

Denso North America Inc. in Canada is one of the country's largest suppliers of corrosion prevention products to the oil and gas transmission industry. However, one of the non-traditional markets for our products and services is the food industry.

Above: Installation of the new high temperature edible oil pipelines.

Left: Wrapping the new pipelengths with Denso Hotline Tape prior to installation.

For many years the company has supplied our petrolatum tapes and primers to the food industry for use by pickling plants, for the protection of brine lines, and refrigeration companies needing products for their cooling equipment, etc.

Recently, the company was called upon to supply our products on a pipe wrapping project involving high temperature edible oil lines in a packaging plant. The company, Can-Amera Foods, is located in Hamilton, Ontario, near Toronto. The oil product, a high quality corn and canola oil, is mostly used on a commercial basis by restaurants for frying foods. The oil is brought into the plant by ship or rail car from Western Canada and is in operation 7 days a week, 24 hours per day, packaging this product. The oil is transported to the plant by a series of buried piping.

With little opportunity for maintenance down time, the company needed a high quality, high temperature coating for their transportation lines that could be applied without major disruption and extensive delays in the plant. Due to severe corrosion of the existing piping, new pipe had to be installed. As well, the anti-corrosion coating had to be applied in a 48 hour time frame in order not to disrupt a nearby rail yard and personnel parking lot. Operating temperatures of these oil lines reached 200°F (93°C) and was well within the operating range of Denso Hotline Tape.

The tape product was applied to the new pipe sections on a rolling pipe support above the trench and once the wrapping was complete, lowered into place and bolted to the next pipe section.

This project was completed well within the two day time frame with minimal disruption to the plant and surface operations and is a prime example of the versatility of Denso for anti-corrosion and waterproofing purposes.

Corrosion Prevention - Jetty Piles / Spash Zone

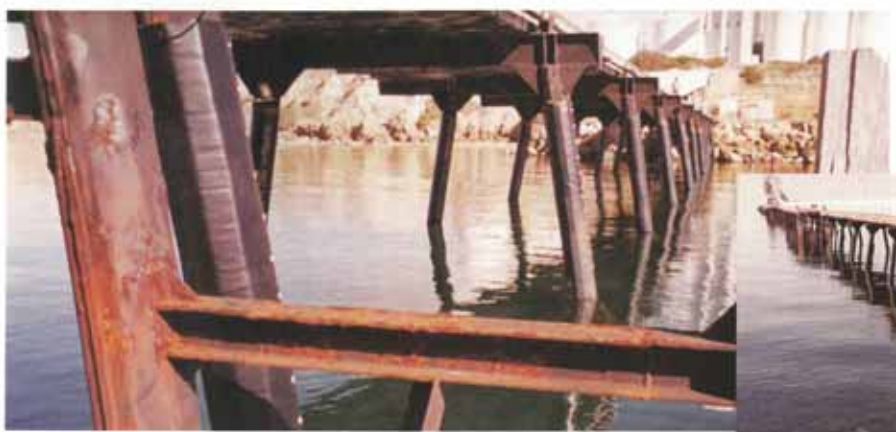
SeaShield Protection for Grain Handling Jetty

SeaShield 250HD System is now accepted as the ultimate system for protection of piling in harsh to extreme environments. The system has been applied to the piling of offshore shipping navigation beacons around the Queensland Coast and in the Torres Strait separating Queensland from Papua & New Guinea.

Giles Jetty, located at the southern tip of the Yorke Peninsula in South Australia is one of the major grain export terminals maintained by the Ports Corporation of South Australia. The location is subject to heavy sea conditions with waves up to 4 metres during the worst climatic conditions.

The Ports Corporation of South Australia required a system that would provide long term protection against corrosion to the piles under the worst possible conditions. After due consideration SeaShield 250HD was selected as the optimum solution.

Adelaide Salvage and Diving won the contract to install the SeaShield 250HD System to 266 HP2 piles for a height of 4 metres in most cases. Work commenced in March 2000 and due to the simplicity of the system, installation rates exceeding all expectations were achieved.



The Giles Jetty - piles protected with the SeaShield 250HD System.

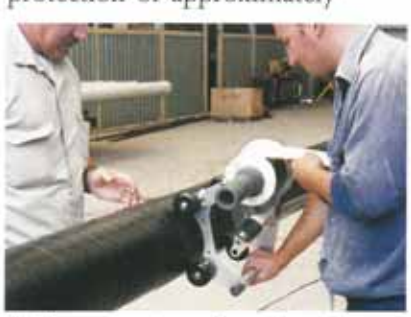
Corrosion Prevention - Buried Pipelines

Alumina Refinery Protects Pipework with Denso

The South West of Western Australia provides a sustainable industry diversified into wine making, agriculture, process plants and Alumina production.

Located 350km south west of Perth, the Worsley Alumina Refinery is currently into the final stages of expansion with the project scheduled for completion by December 2000.

The installation of new below ground pipe work in a particular area of the plant, (originally chosen as HDPE) was changed to steel. Consequently a substantial amount of corrosion prevention material was required for the protection of approximately 1.6km of pipework.



The Densoman wrapping machine speeding up the application of Denso Ultraflex 1500 System.

Denso (Australia) Pty Ltd in conjunction with Kaiser Bechtel, the project engineers recommended the Denso Ultraflex 1500 System which was accepted by our main client, Worsley.

The application of the Denso Ultraflex 1500 System is provided by Stork ICM Australia, located at their fabrication workshop in Rockingham. The tape is applied by the Densoman wrapping machine to provide constant tape tension and a consistent 55% overlap.

The Denso material was purchased through one of Denso (Australia) Pty's major distributors.

Corrosion Prevention - Exposed Steel Pipebridge

Steelcoat 500 System used on Nszezi River Pipebridge

The Denso Steelcoat 500 System has been used to protect Mhlathuze Water 23" bulk water supply, crossing the Nszezi River.

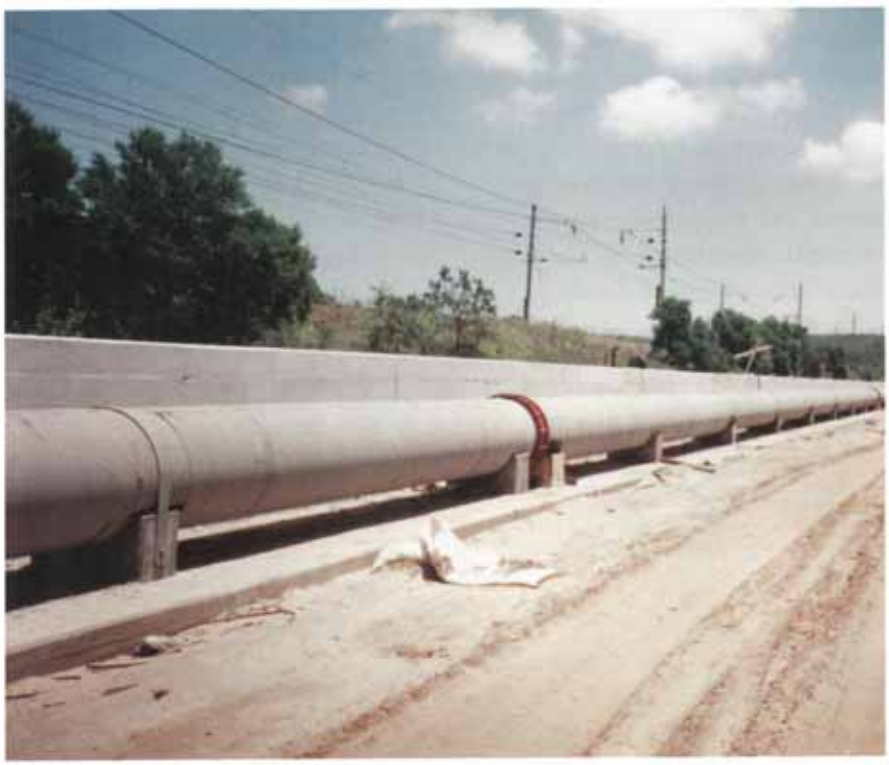
The town of Empangeni on the north coast of Kwazulu Natal has grown considerably over the past couple of years due to the expansion of the industrial area and as a result it became necessary to augment the town's water supply.

A 32"diameter bulk main from the Mhlathuze Water Works was designed to carry the water to the town. Part of the pipeline would span the Nszezi, resulting in 1.2km of pipe being exposed.

Steelcoat 500 System was specified for the corrosion protection. Due to the pipe diameter the barrel was wrapped cigarette fashion with Denso Acrylic Pipeline Tape.

V.J. Couplings were protected with the Steelcoatt 100 System oversealed with Denso D12 Scrim and Denso Acrylic Topcoat.

Below: *Water pipeline protected with Steelcoat 500 system prior to the application of Densoflex Topcoat.*



The quantity of the robust, ultra-violet resistant Denso Acrylic Pipeline Tape utilised in the project, exceeded 4000 square metres in total.

Steelcoat 500 System overcoated with blue Densoflex Topcoat.

The tanks were first cleaned to SA2½.

Denso Protects Earth Covered Tanks, Taiwan

A total of 98 buried vessels or earth covered tanks (ECT) were erected for refinery and olefin plant storage by Formosa Petrochemical Corporation in the massive No 6 Naptha Cracking Project, Taiwan.

The tanks designed by German Company, Tractable Gas Engineering, were erected strictly in accordance with DIN standards and when a corrosion prevention coating was specified to meet the requirements of DIN 30673,contractors Noell Hamburg, selected a Denso reinforced bitumen tape for long-term protection.

The tanks measuring 7.4 and 8 metres in diameter by 74.2 and 82.3 metres long have a storage capacity of 3,000 and 4000m³. They were first cleaned to SA2½ then primed with Denso Primer D.
Two layers of Densotherm 35 Tape was then applied to ensure a minimum thickness of 6mm average.

Pinhole tests were then carried out to establish the coating integrity before the tanks were finally transported to the prepared site and mounded.

Sole exclusive Denso agents in Taiwan, Parallel Industrial Co. Ltd, obtained the contract for the tank protection.

Above: Wrapping the tanks with Densotherm 35 Tape.
Below: The finished tanks were blinded with white water based coating to reflect the sunlight during transportation.

Corrosion Prevention - Exposed Storage Tanks

Tank Base Protection - The Ground Moves but Denso Stays Intact

The photograph shows, one of several tanks belonging to Dow Chemical, Taiwan, taken after a huge earthquake occurred in September 1999.

The bottom plate of this tank has been protected against corrosion by using Densyl Mastic and Denso Covercoat Tape for 9 years now.

After the earthquake, Dow Chemical inspected the tanks and found that anchor bolts had been loosened due to the severe ground movement but that the Denso system had remained intact with excellent adhesion to the tank and no cracking of the system. An amazing demonstration of the Denso system's ability to absorb severe movement yet remain in reliable service during extreme conditions.

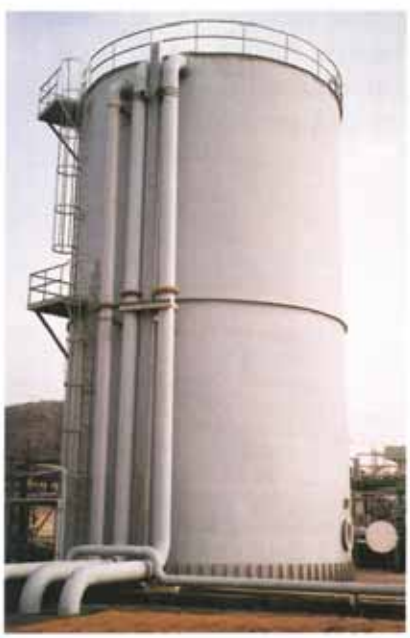
The contract for the tank base protection was obtained by sole exclusive Denso agents in Taiwan, Parallel Industrial Co. Ltd.

Nine year old Denso System still giving good service.

Linings - Storage Tanks

Archco-Rigidon Lining Protects Thermal Power Plant Tank

A boiler ash storage tank at the The Samchonpo Thermal Power Plant, Korea, was recently lined with glass flake and vinyl ester reinforced Archco-Rigidon 523D, and then overcoated for extra protection with 423D.



ARCHCO RIGIDON
Resistant Materials

Left: The boiler ash storage tank.

Right: Inside of tank lined with Archcoat 523D and 423D.

The tank was first made safe by installing work platforms and removing any rubber objects inside. The steel surface was then cleaned to SA2½ and the resulting debris and moisture removed by vacuum. After cleaning an inspection was carried out to establish the relative humidity and dew point before priming commenced. A coat of 523D was applied over the PD2 Primer followed by a 1mm final coat of 423D. A stripe coat was applied to all raised or sharp edges between the 1st and 2nd coats.

When cured, the lining was checked for defects and any found were repaired accordingly.

The tank is now ready to resume its duties with a fully resistant lining to protect it against the highly corrosive nature of boiler ash.

The contract to line the tank was obtained by Archco-Rigidon agents in Korea, Kyung Han Industrial Company Ltd.

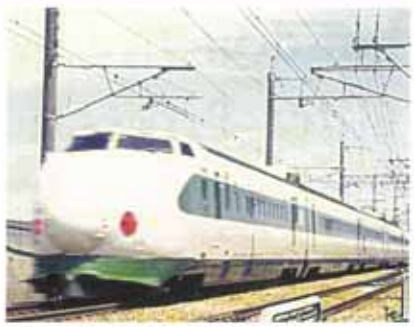
Corrosion Prevention - Exposed Pipeline

New Bullet Train Line Pipework Protected with Denso

The 139km of railway line that runs from Tokyo to Niigata called the Shinkansen Line, crosses approximately 75.3km of high mountainous terrain. To enable the railway to run to schedule, free from snow and ice during the winter, a special snow melting system is utilised in this area.

The system works by spraying heated water from a 200, 250 or 300mm diameter pipeline that runs alongside the rails, directly onto the bottom of the coaches to melt and blast away any snow that has accumulated there. The system is in operation from November until March every year.

In 1980 when the system was originally constructed, it was agreed that some areas of the heated pipeline would need a corrosion prevention coating and a trial application of Denso Tape was made onto 2km of the pipeline. Inspection at a later date revealed that the tape coating was completely effective and as a result, in 1997, Japanese National Railway approved the contract with Denso's sole exclusive Japanese agents, Shibata Co .Ltd, to wrap the designated sections of the heated pipeline.



Above: A train on the Shikansen Line.
Left: Application of Denso Tape to the heated water pipeline.

The application of the Denso Tape System can only be carried out during the summer months and progress so far is as follows;

1997 Total = 3,988m of pipe.

1998 Total = 8,350m of pipe.

1999 Total = 8,487m of pipe.

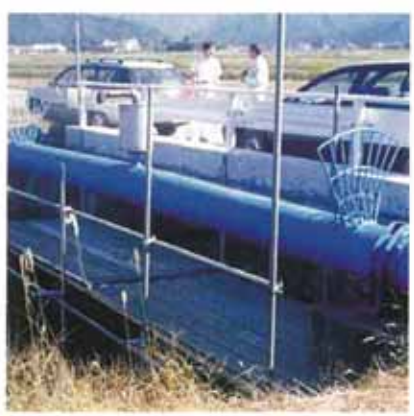
As the figures show, to-date a distance of 20.825km has been protected with the remaining 50km scheduled to be completed over the next seven years.

Corrosion Prevention - Exposed Pipeline

Japanese Water Bridge after 16 Years Denso Protection

This water bridge in Niigata City, Japan was protected by an application of Denso Tape covered with fibre reinforced plastic in 1983

The site was revisited in 1999 and a small section of the coating was cut and peeled back to examine the condition of the steel underneath. Upon exposing the steel pipe it was found to be in perfect condition, the same in fact, as the day it was wrapped with the Denso System 16 years ago.

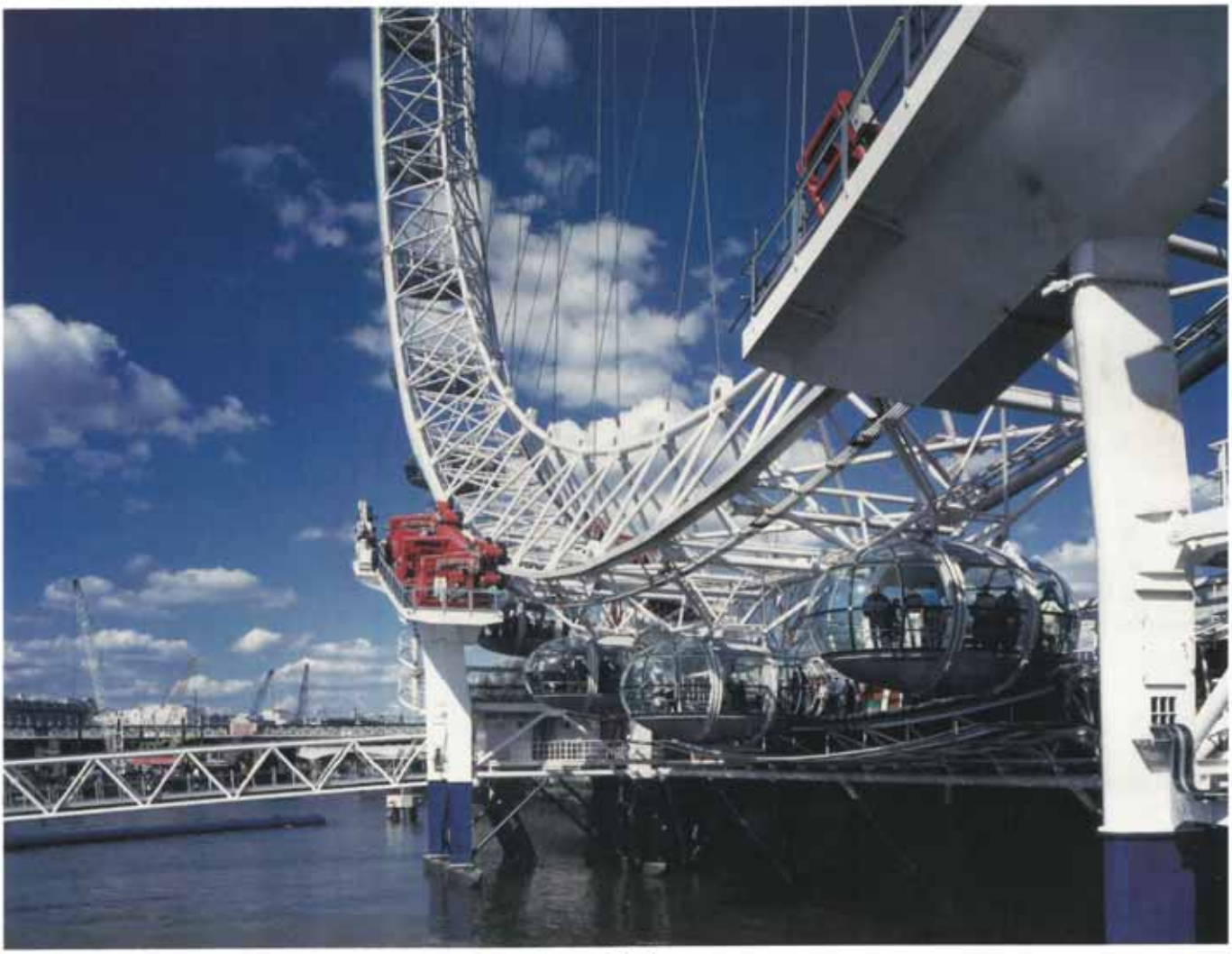


Above: The protected water pipebridge.
Left: Removal of the coating revealed the pipe to be in good condition.

The contract was obtained by Denso's sole exclusive Japanese agents, Shibata Co. Ltd,

London Eye gets Denso Void Filler Protection

British Airways' London Eye is the latest example of the wide variety of anti-corrosion applications being found for Winn & Coales' Denso Void Filler.



The base of the London Eye's restraint towers are partially submerged in the River Thames at high tide.

The 135m diameter wheel of the London Eye weighs 1,500 tonnes, which can be up to 2,000 tonnes when each capsule is full. The engineering contractors, Tilbury Douglas Construction Ltd, point out that an important feature is the restraint towers, which control the speed of the wheel. The restraint towers can also lock the wheel in position in the event of high winds, up to hurricane force - when it will obviously be closed to the public.

The leg of each restraint tower is fixed to a box beam of Macalloy bars, which is secured to the reinforced concrete plugs attached to the top of the foundation piles.

As a result of the London Eye's location on the South Bank of the River Thames, the top of the Macalloy bars are covered with water at high tide. Protection from this corrosive environment is provided by Denso Void Filler, a petrolatum compound containing additives to displace moisture and inhibit corrosion. The compound is pumped hot or cold into cavities where it forms a semi-solid paste.

Denso Joint Protection for WRK Project in The Netherlands

For many years water has been transported from an intake in the Dutch River Lek, a branch of the River Rhine, to the dunes near the west coast where it is filtered naturally by the sand to become acceptable drinking water.

The water is transported using three concrete pipelines, one 1500mm diameter and two parallel lines of 1200mm diameter. The total capacity of these three pipelines is never less than 10 million litres per hour.

In the neighbourhood of Utrecht the ground-plan is situated in a narrow strip between the A2 Motorway and the railroad between Amsterdam and Utrecht. With the planned redoubling of both motorway and railroad a lot of ground work will be necessary and WRK, owner of the pipelines needed to make sure that during the building work the water transportation was not interrupted in any way. To exclude all risks it was decided to rehabilitate the pipelines.

The chosen option included applying a plastic lining to all of the pipes and utilising Viking Johnson Linergrips to connect the plastic linings.

To connect the 350m lining sections, concrete couplings were installed between the Linergrips. This rehabilitation involved the use of 12 concrete couplings and 16 Linergrips. Although the Linergrips are Rilsan coated it was decided to apply additional protection and Imbema Denso, our associated company in the Netherlands, recommended the use of Densyl Mastic Blankets to fill any voids, irregularities etc between the nuts and bolts, overwrapped with Denso Tape to finish the protection.

Two of the rehabilitated pipeline's VJ couplings ready for Denso protection.

Although this application was not a major part of the project, the corrosion protection of the important jointing systems played a crucial role and will ensure that no future joint maintenance will be required.

Application of the Denso Tape system.

261.6.2000 Vol 23 No.4 Quarterly Publication

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Front cover:
View of two of the Formosa Petrochemical Corporation's vessels
(see story page 7).

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