

# PipeAssure™: a composite pipeline repair system

A CSIRO–PETRONAS research team have developed an adhesive composite wrap, named PipeAssure™. The revolutionary technology functions as an overwrap to protect and repair damaged sections of pipelines.

CSIRO is seeking commercial partners to demonstrate the pipeline repair technology in Australia and bring it to market for use across the oil and gas industry.

## The opportunity

PipeAssure™ has the potential to become a significant repair technology in the oil and gas industry. Successful trials have already been conducted on risers in splash zones, with a broad range of other potential applications including pipelines exposed to the high pressures and temperatures in subsea environments.

The PipeAssure™ technology presents investment opportunities for manufacturers, service providers and suppliers to the oil and gas industry, to engage in the manufacture and application of this new repair system.

## The technology

The PipeAssure™ product is a composite material consisting of a plain woven E-glass fibre fabric pre-impregnated with a proprietary epoxy resin. The product is curable in dry, wet and subsea conditions and effectively protects pipelines against corrosion whilst also providing structural reinforcement.

## Features and benefits

Features include:

- ♦ pressure containment and/or strengthening of damaged pipelines
- ♦ lightweight and flexible, allowing for application to structures of different sizes and shapes
- ♦ the ability to bond to steel pipelines even when applied underwater
- ♦ the ability to remain bonded to a pipeline at high temperature and pressure
- ♦ no hot-work required
- ♦ can be applied to live pipelines without the need for shutdown
- ♦ qualified to perform in accordance to ISO 24817, ASME PCC-2 and PTS 30.48.00.31-P.

In addition to the numerous technical capabilities of the PipeAssure™ technology, its significant advantage is the ability to be applied with minimal interruption to production. Application of the adhesive wrap provides compromised pipelines an increased lifespan, enabling operators to schedule installation of a replacement section at their own convenience, with minimum downtime.

## Applications

The PipeAssure™ composite material was specifically designed to meet the requirements for application to subsea pipelines. It is also suitable for application to other submerged structures such as risers and for marine vessel repair, as well as land-based buried oil pipelines, bridges and other units in refineries and process plants.

The team is currently examining further potential applications for the PipeAssure™ product in a range of industries.



Badly deteriorated corrosion protection coating can be cost effectively replaced with PipeAssure™.

## Case study: Externally corroded risers

The original neoprene protective coating on three risers located at the splash-zone area of a PETRONAS offshore platform had deteriorated. PipeAssure™ was used to repair the risers.

### REPAIR CONDITIONS:

- ♦ Three 10-inch risers located in splash-zone environment
- ♦ Length of repair segments: 40 inches
- ♦ Ambient air temperature: 30°C
- ♦ Pipe temperature: 28°C
- ♦ Pipe pressure: ambient

### APPLICATION PROCEDURE:

The damaged neoprene coating was removed from the risers and the surface was grit blasted to SA2.5. PipeAssure™ was then applied to the bare metal surface.

### RESULTS:

PipeAssure™ successfully restored the corrosion integrity of the risers. The measured transverse adhesion strength is approximately 12.70MPa, more than three times the splash-zone requirements of 3.45MPa set forth in PTS 30.48.00.31-P for similar coatings.

## Safety and environment

The PipeAssure™ technology overcomes some of the significant health and safety concerns associated with the repair of subsea pipelines, through:

- ♦ a potential reduction of organic pollutants in the marine environment as a result of improved pipeline repair and maintenance methods; and
- ♦ eliminating the need for underwater welding, creating a less hazardous method of pipeline repair.

PROPERTIES	TEST STANDARD	TYPICAL VALUE
<b>Density (kg/m3)</b>	<b>ASTM D792</b>	<b>1659.2</b>
<b>Coefficient of Thermal Expansion, × 10-6: Longitudinal (ε/°C) / Transverse (ε/°C)</b>	<b>ASTM E831</b>	<b>29.7 / 25.1</b>
Tensile Strength (MPa) / Modulus (GPa)	ASTM D 3039	280 / 19.5
Adhesion Strength (MPa): Transverse (MPa) / Lap Shear (MPa)	ASTM D4541 / ASTM D5868	10.0 / 16.5
Glass Transition Temperature, Tg (°C)	ASTM D6604	130*
Pot life at 30°C (mins)	N/A	60
Curing Time (days) **	N/A	1 - 4***
Hardness (Shore D)	ASTM D2583	80
Corrosion resistance: Salt Spray Test – Unscribed / Scribed	ASTM B117	Passed 4 500hrs / 3 000 hrs
<b>Dielectric Strength (kV/mm)</b>	<b>ASTM D149</b>	<b>10.9</b>
Cathodic disbondment	ASTM G8 / AS 4352	Passed; zero disbondment
Type A Pressure Tests (80% wall loss)	ASTM 1599 & ISO 24817	Passed
Type B Pressure Tests (hole sizes 10, 15 and 25 mm): Fracture toughness (I/m <sup>2</sup> )	ASTM 1599 & ISO 24817	120

\* Cured at 90°C \*\* Time required to achieve properties \*\*\* Depending on curing temperature

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