

## 1. SCOPE

Welding is a proven technology for reliably repairing pipelines and structures. Composites on the other hand are a relatively recent innovation when it comes to repairing metal structures but an increasing number of applications are in service. This document provides guidance to the benefits of using composite materials as a methodology for repairing pipelines.

## 2. BACKGROUND

In the engineering field it might be appropriate to describe a composite as a material consisting of at least two distinct material components, separated by an interface, and manufactured in a controlled manner to produce a product that achieves a combination of properties that would have otherwise not been possible from the individual components alone. Two well-known polymer matrix composite materials are carbon fibre reinforced plastic (CFRP) and glass fibre reinforced plastic (GFRP) and in the last 20 years, in particular, these materials have been found in an increasing number of engineering applications which exploit their unique properties.

## 3. REPAIR CONCEPT

The purpose of a repair is to restore structural integrity to a damaged component. When damage arises it is important to understand why. Failure to do this may render a repair useless. Once this has been established the repair approach broadly follows the following:

- Design/engineering justification
- Commercial assessment
- Surface preparation
- Installation of composite repair system
- Repair verification
- Reporting

## 4. KEY BENEFITS OF COMPOSITE REPAIR

- Repairs can be classed as permanent
- Chemical bond to steel provides leak sealing capability with chemical & environmental resistance
- No interruption to plant operation during repair installation
- Install at full line pressure (reduced pressure is recommended)
- Site access & preparation issues minimized
- Lightweight repair kits are easy to transport & handle
- Materials formed to shape on site with no pre-fabrication
- Flexible materials conform to difficult shapes
- No hot work required
- Quick repair technique
- No post weld heat treatment required
- Applications in confined and congested areas (as little as 6" or 150mm radial clearance around the pipe)
- Operates under pressures up to 3,000 psi
- Operates in temperatures from -50°C to +170°C
- Trained personnel required versus skilled labor
- Cost-competitive with welding

## 5. APPLICATIONS

- Offshore drilling – including complex geometries (flanges, valves, tees and elbows), flare lines, caissons, risers and riser arches, decks, cuttings chutes and more
- Refining and petroleum – from cooling water lines to salt water header and connecting lines
- Thermal, hydro and nuclear power
- Chemical and pharmaceutical – including tank and vessel repair and strengthening, and pipework repairs in a wide range of temperatures

## 6. ACKNOWLEDGMENT

WTIA wishes to acknowledge the contribution of the WTIA SMART Water Industry Sector Group.

**DISCLAIMER:** While every effort has been made and all reasonable care taken to ensure the accuracy of the material contained herein, the authors, editors and publishers of this publication shall not be held to be liable or responsible in any way whatsoever and expressly disclaim any liability or responsibility for any injury or loss of life, any loss or damage costs or expenses, howsoever incurred by any person whether the reader of this work or otherwise including but without in any way limiting any loss or damage costs or expenses incurred as a result of or in connection with the reliance whether whole or partial by any person as aforesaid upon any part of the contents of this publication. Should expert assistance be required, the services of a competent professional person should be sought.

<b>NDNP TECHNOLOGY DIFFUSION ACTIVITY # 27</b>	 Welding Technology Institute of Australia ABN 69 003 696 526	<b>Document No:</b> 9.4.3QR-0001
	<b>NATIONAL DIFFUSION NETWORKS PROJECT TECHNOLOGY QUESTIONNAIRE Water Industry Group "Benefits of Composites for Pipeline Repair"</b>	<b>Revision No:</b> Rev 1
		<b>Page 1 of 2</b> <b>Date:</b> 18 Nov 2005

As part of the WTIA National Diffusion Networks Project the Water Industry Sector identified the need to introduce alternative pipeline repair technologies into the industry. The WTIA has prepared a Technical Guidance Note "Benefits of Composites for Pipeline Repair" to explain the benefits of an alternative repair method using composites. As a valued technology expert in this area we would like you to be part of the Technology Expert Group to review this note. Please complete this questionnaire so that we can gauge the success of meeting this need.

**Objective 1: Identify the use of composites for alternative pipe repair technology**

There is an increasing need to carry out in-situ repairs to leaking water pipelines due an aging infrastructure. Composite repairs have been successfully applied for oil and gas pipelines and the technology is now available for water pipelines. This guidance note is intended to provide the Water Industry with the features, properties, benefits and applications of composites for water pipeline repair applications. How well does the document explain the benefits of composite repair technology?

poor  average  good  very good

Comments: \_\_\_\_\_

**Objective 2: Identify appropriate technology receptors in the Water Industry**

This document was written for Designers and Maintenance Engineers in the Water Industry. Are these people the appropriate individuals we should be targeting?

yes  no

What other types of companies and/or personnel do you suggest we target? \_\_\_\_\_

**Objective 3: Identify latest composite pipeline repair technology**

The document was written to reflect current best practice and latest technology for composite pipe repairs. Do you envisage opportunities for the use of this technology in the industry?

yes  no

If yes, what and where, if no why not? \_\_\_\_\_

**Objective 4: Is the information provided clear, concise and accurate?**

yes  no

If not, why? \_\_\_\_\_

**Objective 5: Broad dissemination of technology to the Water Industry**

Please indicate how best to disseminate this Technical Guidance Note to the appropriate Water Industry Recipients

Free Website Download  Poster  Pocket Guide  Pamphlet

If poster, what size? A1  A2  A3  Laminated  What selling price? \$

If a pocket guide, what selling price? \$

Other format? \_\_\_\_\_

<b>NDNP TECHNOLOGY DIFFUSION ACTIVITY # 27</b>	 <b>WTIA</b> <small>Welding Technology Institute of Australia</small> ABN 69 003 696 526 <b>NATIONAL DIFFUSION NETWORKS PROJECT TECHNOLOGY QUESTIONNAIRE Water Industry Group "Benefits of Composites for Pipeline Repair"</b>	<b>Document No:</b> 9.4.3QR-0001
		<b>Revision No:</b> Rev 1
		<b>Page 2 of 2</b> <b>Date:</b> 18 Nov 2005

**Objective 6: Continuous Improvement**

Please Identify areas where the document can be improved or return the document with your recommended additions/amendments. Alternatively, please use the area below to provide any additional comments.

---

---

---

---

---

---

---

---

---

---

*Respondents Name:* \_\_\_\_\_ *Company:* \_\_\_\_\_ *Phone:* \_\_\_\_\_

*Fax:* \_\_\_\_\_ *Email:* \_\_\_\_\_ *Date:* \_\_\_\_\_

**Please Fax (02 9748 2858) or E-mail (j.baker@wtia.com.au) your response.**

**Your prompt response is appreciated.**

The WTIA has joined forces with industry and government to create a 3.5 million dollar Technology Support Centres Network. This network will assist industry to identify and exploit world's best technology and manufacturing methods to establish a vibrant Australian industry beyond 2006. Together we will be implementing a step by step process which will lead to ongoing viability and greater profitability for all concerned:



- (1) Determine your technological and manufacturing needs;
- (2) Identify world's best practice;
- (3) Draw upon the network to implement world's best practice at your site

