Official Publication of The Australasian Corrosion Association Inc • www.corrosion.com.au

CORROSION & MATERIALS

Vol 40 No 1, February 2015
ISSN 1326-1932

Inside this Issue:

CORROSION & PREVENTION 2015

CONCEPT | IMPLEMENTATION | MONITORING | OUTCOMES

Proudly presented by:

Major Sponsor:

Adelaide Convention Centre • Adelaide, South Australia, Australia • 15 - 18 November 2015

FIRST ANNOUNCEMENT & CALL FOR PAPERS

Corrosion and Prevention is the annual conference of the Australasian Corrosion Association, it's a 4 day gathering of world experts on corrosion mitigation. This will be a premium networking event as well as a source for the latest information concerning corrosion mitigation.

Entitled Corrosion & Prevention 2015, the conference will feature a program of keynote speakers and presentations under a range of industry streams and is expected to attract approximately 450 - 550 delegates.

In 2015 we invite you to the vibrant city of Adelaide, which is internationally regarded as a wine and food mecca, add in a temperate Mediterranean climate and Adelaide is the ideal place for mixing business with pleasure. All in all, this promises to be an enlightening, exciting and highly enjoyable conference.

Call for Papers

Submissions are now welcome on all aspects of corrosion and corrosion control for Corrosion & Prevention 2015. Papers are subject to peer review and if accepted will be published in the Conference Proceedings. Critical dates for acceptance of abstracts and papers are:

Close of Abstracts: 13 March 2015

Acceptance of Abstracts: 3 April 2015

Receipt of Papers: 5 June 2015

Submit an Abstract

Please refer to www.acaconference.com.au to submit a 200-300 word summary of your proposed paper by the close of abstracts (13 March 2015). Waldron Smith Management, a professional conference management company based in Melbourne, will be managing the abstract and paper submission process.

Guide to Submission

Papers submitted to the Corrosion & Prevention 2015 Conference must be unpublished works. It is the responsibility of the author to obtain necessary clearance/permission from their organisation. Copyright of the paper is assigned to the ACA. Abstracts should include the names of all authors, an appropriate title and a brief summary. All authors whose papers are accepted are required to attend the conference to present.

The Destination

Nestled between the beautiful Adelaide Hills and the long white beaches of the Gulf of St Vincent, Adelaide is a picturesque city featuring wide boulevards surrounded by parklands around the city centre. Its position on the banks of the Torrens River amongst superb gardens also gives the city a relaxed atmosphere and a lifestyle that is the envy of all who visit.

Adelaide is internationally regarded as a wine and food 'destination' - offering locally produced world-class wines matched with fresh local produce; resulting in amazing dining experiences that are unforgettable.

South Australia is made up of spectacular regions, all of which offer a unique and exhilarating experience waiting to be discovered. Amongst the many reasons people visit South Australia are the spectacular scenery, fishing, fauna and national parks - wine and food are often at the top of the list. South Australia's wineries are legendary - the Barossa Valley, McLaren Vale, Clare Valley, Coonawarra and Adelaide Hills are sought out by many visitors.

www.southaustralia.com

CORROSION & PREVENTION 2015

CONCEPT | IMPLEMENTATION | MONITORING | OUTCOMES

Proudly presented by:

Major Sponsor: JOTUN

Technical Streams

Corrosion and Prevention 2015 invites technical papers on all subjects related to corrosion. The conference will bring together leading researchers and industry practitioners who combat corrosion on a daily basis. Diverse technical streams will showcase the latest developments in corrosion, ranging from fundamental corrosion science to hands-on application. Submissions may include research papers, posters, review papers and case studies related to the industry sectors and technical streams listed below.

- Advances in Sensing & Monitoring
- Asset & Integrity Management
- Cathodic/Anodic Protection
- Concrete Corrosion & Repair
- Corrosion Mechanisms, Modelling and Prediction
- Materials Selection & Design
- Marine Corrosion
- Mining
- Non-Destructive Evaluation (NDE)
- Novel Materials and Their Application
- Oil & Gas
- Power & Energy
- Protective Coatings
- Water & Wastewater

Industry Sectors

Attracting approximately 450–550 delegates, this conference will have material of value to: Consultants, Asset Owners, Contractors, Suppliers and Academics within the following industries

- Buildings & Construction
- Consulting Engineering and Technical Services
- Cultural & Historical Materials Preservation
- Defence, Aviation, Maritime
- Education & Research
- Marine Transport & Infrastructure
- Mining & Resources
- Oil & Gas
- Power & Energy
- Water & Wastewater

Conference Committee

Conference Convenor Alan Bird

Technical Chair Erwin Gamboa

Conference Committee

• Mohammad Ali • Brian Hickinbottom • Peter Hosford
• Raman Singh • Dean Wall

Sponsorship and Exhibition

Corrosion & Prevention 2015 offers strong branding and exposure in a focussed and professional environment. As with every Corrosion & Prevention Conference, the exhibition will be an integral part of the activities. It provides an opportunity for organisations to come face to face with the delegates; providing a marketplace to increase your organisation's visibility and to showcase and demonstrate your products and services.

For further information, please contact the Australasian Corrosion Association on +61 (0)3 9890 4833 or email conference@corrosion.com.au

Your Hosts

The Australasian Corrosion Association Incorporated (ACA) is a not-for-profit, industry association, established in 1955 to service the needs of Australian and New Zealand companies, organisations and individuals involved in the fight against corrosion.

The vision of the ACA is to be leaders throughout Australasia in disseminating knowledge to enable best practice in corrosion management, thereby ensuring the environment is protected, public safety enhanced and economies improved.

The Australasian Corrosion Association Inc
PO Box 112
Kerrimuir, Victoria, Australia, 3129
Ph: +61 (0)3 9890 4833, Fax: +61 (0)3 9890 7866
Email: conference@corrosion.com.au
Website: www.acaconference.com.au

CONTENTS

Corrosion & Materials

Corrosion & Materials is the official publication of The Australasian Corrosion Association Inc (ACA). Published bi-monthly, *Corrosion & Materials* has a distribution of 2,500 to ACA members and other interested parties. Each issue features a range of news, information, articles, profiles and peer reviewed technical papers. *Corrosion & Materials* publishes original, previously unpublished papers under the categories 'Research' and 'Professional Practice'. All papers are peer reviewed by at least two anonymous referees prior to publication and qualify for inclusion in the list which an author and his or her institution can submit for the ARC 'Excellence in Research Australia' list of recognised research publications. Please refer to the Author Guidelines at www.corrosion.com.au before you submit a paper to Brendan Pejkovic at bpejkovic@corrosion.com.au with a copy to bruce.hinton@monash.edu

ACA also welcomes short articles (technical notes, practical pieces, project profiles, etc.) between 500 – 1,500 words with high resolution photos for editorial review. Please refer to the Article Guidelines at www.corrosion.com.au before you submit a short article to Brendan Pejkovic at bpejkovic@corrosion.com.au

The Australasian Corrosion Association Inc

The ACA is a not-for-profit, membership Association which disseminates information on corrosion and its prevention or control by providing training, seminars, conferences, publications and other activities.

Vision Statement

To be leaders throughout Australasia in disseminating knowledge to enable best practice in corrosion management, thereby ensuring the environment is protected, public safety enhanced and economies improved.

Front Cover Photo:
Smart Maintenance at the Eastern Treatment Plant (Melbourne Water)
(Image Courtesy of Mattioli - Innovators in Protective Coatings).

The ACA is a founder member of the World Corrosion Organization

CORROSION & MATERIALS

ISSN 1326 -1932
Published by The Australasian Corrosion Association Inc.
ABN: 66 214 557 257

Editor
Ian MacLeod – Western Australian Museum
ian.macleod@museum.wa.gov.au

Associate Editors
Research: Bruce Hinton – Monash University
bruce.hinton@monash.edu

Professional Practice: Willie Mandeno – Opus International Consultants
willie.mandeno@opus.co.nz

News: Tracey Winn – The Australasian Corrosion Association Inc,
twinn@corrosion.com.au

Reviewers
Andy Atrens – University of Queensland
Nick Birbilis – Monash University
Frederic Blin – AECOM
Lex Edmond
Harvey Flitt – Queensland University of Technology
Maria Forsyth – Deakin University
Rob Francis
Warren Green – Vinsi Partners
Graeme Kelly – Corrotec Services
Grant McAdam – Defence Science & Technology Organisation
David Nicholas – Nicholas Corrosion
Graham Sussex – Sussex Material Solutions
Tony Trueman – Defence Science & Technology Organisation
Geoffrey Will – Queensland University of Technology
David Young – University of New South Wales

Advertising Sales
Tracey Winn – The Australasian Corrosion Association Inc,
twinn@corrosion.com.au
Ph: 61 3 9890 4833 | Fax: 61 3 9890 7866

Subscriptions
Print Version: ISSN 1326-1932
Subscription rates:
Within Australia: AU$72.60, incl GST
Outside Australia: AU$77.00, excl GST posted airmail

The Australasian Corrosion Association Inc
PO Box 112, Kerrimuir, Victoria 3129, Australia
Ph: 61 3 9890 4833
Fax: 61 3 9890 7866
E-mail: aca@corrosion.com.au
Internet: www.corrosion.com.au

ACA Branches & Divisions

Auckland Division: Grant Chamberlain	64 21 245 9038
Newcastle: Nathan Spencer	61 439 511 836
New South Wales: Jim Galanos	61 2 9763 5611
Queensland: Cathy Sterling	61 7 3821 0202
South Australia: Dennis Richards	61 0 419 860 514
Tasmania: Grant Weatherburn	61 0 418 120 550
Taranaki Division: Ron Berry	64 27 671 2278
Victoria: John Tanti	61 3 9885 5305
Wellington Division: Monika Ko	64 4 978 6630
Western Australia: Phil Schmidli	61 4 5148 0090

ACA Technical Groups

Cathodic Protection: Bruce Ackland	61 3 9890 3096
Coatings: Matthew O'Keeffe	61 437 935 969
Concrete Structures & Buildings: Frédéric Blin	61 3 9653 8406
Mining Industry: Ted Riding	61 3 9314 0722
Petroleum & Chemical Processing Industry: Fikry Barouky	61 402 684 165
Research: TBA	
Water & Water Teatment: Matthew Dafter	61 419 816 783
Young Corrosion Group: Dean Ferguson	61 0 425 784 932

*all the above information is accurate at the time of this issue going to press.

CONTENTS

Vol 40 No 1, February 2015

Paul Vince
Chairman

Happy New Year. I hope you have a prosperous and successful New Year!

On 29 November the ACA Board met for the first time under the new Constitution. A summary of the Board's business has been distributed via Corrosion Matters. There is significant activity occurring in the areas of training and events. But there is also much planning and establishment work occurring to set up our new structure and reporting arrangements.

At the meeting the Board considered our mission and vision. Our vision is to be leaders throughout Australasia in disseminating knowledge to enable best practice in corrosion management, thereby ensuring the environment is protected, public safety enhanced and economies improved. A bit of a mouthful!

However, it can be summarised simply. The core of our vision is to reduce the impact of corrosion. We do this through all of our activities; training to increase corrosion literacy, publications to enhance corrosion awareness and events to establish networks of corrosionists that can be utilised to find solutions to corrosion issues every day.

The task of reducing the impact of corrosion is intrinsically incorporated in the careers of so many of our members. We specify and apply coatings, we design and install cathodic protection systems, we plan for the durability of buildings and structures, we inspect assets and determine remaining life. Our work meets the needs of our employers and clients. We also protect the environment and public safety and achieve satisfactory financial returns.

Just by working in the corrosion industry you are helping the ACA achieve its vision of reducing the impact of corrosion! Well done and thanks for your contribution.

And don't forget, if you have found the activities of the ACA to be valuable, tell a friend – it could help us all.

Yours Sincerely

Paul Vince
ACA Chairman

ACA 2015 Events Calendar

Part of the role of the ACA is to organise events that bring together industry experts to present on new technologies, updates to standards, and share knowledge and experiences via case studies on a variety of projects. 2015 will be no different, with the events listed below scheduled in our Calendar of Events.

Event Title	Event Date	Event Location
Protective Coatings	19 March 2015	Adelaide
Water & Water Treatment	26 March 2015	Melbourne
Durability Planning	14 May 2015	Auckland
Corrosion in the Oil & Gas Industries	21 May 2015	Melbourne
Concrete Corrosion	25 June 2015	Perth
APIA/ACA - Pipeline Corrosion Management	23 July 2015	Brisbane
Introduction to Corrosion	30 July 2015	Melbourne
Introduction to Corrosion	30 July 2015	Sydney
Protective Coatings	13 August 2015	Perth
Corrosion in the Oil & Gas Industries	27 August 2015	New Plymouth
Corrosion in the Power & Energy Industry	3 September 2015	Brisbane
Concrete Corrosion	17 September 2015	Sydney
Corrosion & Prevention 2015 Conference	15 – 18 November 2015	Adelaide

ACA members will receive further details on each event as appropriate throughout the year, but for now, please include these in your 2015 diary. For further information on these events for 2015 please don't hesitate to contact Brendan Pejkovic (bpejkovic@corrosion.com.au) in the ACA office on +61 (0)3 9890 4833.

Branch Events

Each of the 8 ACA Branches will conduct regular technical events throughout 2015. To enquire, you may contact your local Branch at the following email addresses:

New South Wales: nsw@corrosion.com.au
New Zealand: nz@corrosion.com.au
Newcastle: ncl@corrosion.com.au
Queensland: qld@corrosion.com.au
South Australia: sa@corrosion.com.au
Tasmania: tas@corrosion.com.au
Victoria: vic@corrosion.com.au
Western Australia: wa@corrosion.com.au

YCG Events

Targeting individuals under 35, new to the corrosion industry and/or interested in the corrosion industry, the ACA Young Corrosion Professionals conduct regular events. For further details email ycg@corrosion.com.au or go to www.corrosion.com.au

THE AUSTRALASIAN CORROSION ASSOCIATION INC
YOUNG CORROSION GROUP

Please refer to **www.corrosion.com.au** for up to date details on all ACA activities.

Wesley Fawaz
Executive Officer

Following the Darwin conference in September last year, the last quarter of 2014 topped off a very active year with our in-house and public training offerings. In fact, last year the ACA provided training for more Australasian students in any year, than ever before.

Late last year, the ACA also announced a trial of the SSPC Concrete Coating Inspection course. Taking place next month in Melbourne, interest has been very well received and this course may be an ongoing ACA offering.

The ACA financial year is based on the calendar year and we finished off 2014 in a positive cash position against a deficit budget. The 2014 financial audit is currently underway and the financial accounts will be presented during the Annual General Meeting in May.

Implementation of the governance review conducted last year continues with the Board most recently approving a Board Charter during the November 2014 Board meeting and this can be viewed online at www.corosion.com.au. The Charter outlines the roles, responsibilities and authorities of the Board.

I really enjoyed reading the scholarship reports from Dean Ferguson and Matt Dafter in this issue of *Corrosion & Materials* who recently returned from overseas attending conferences, visiting headquarters of global corporations, meeting like-minded associations, etc. Hopefully by reading these tales, members will be inspired to apply for scholarships offered by the ACA Foundation this year.

One member benefit which isn't being utilised by many members is the ACA online library which provides access to over 4,000 conference and technical papers. To encourage members to visit the library, please see page 13, in this issue for log in details and the opportunity to win a conference registration to this year's conference.

There have been recent staff changes in the office. In the December issue of *Corrosion & Materials*, I announced the retirement of Jackie Jones after eight years with the ACA. This provided an opportunity to restructure the accounts role and we have now welcomed Suzzanna Selvey who started in the first week of January into a newly created accounts position. After six years, we said goodbye to Renata Fularczyk just prior to Christmas who is now a student of English Language Teaching to Adults at Holmesglen TAFE. As many of our members would attest to, Renata made significant contributions to the ACA and we all wish her the very best on her change of career.

The ACA will continue to provide many networking and professional development opportunities for its members and industry in 2015 through local Branch activities, a broad range of one day seminars, training courses and of course the annual conference.

Corrosion & Prevention 2015 will be held in Adelaide which was recently listed as 'One of the Top Places to Go in 2015' by *the New York Times*. Call for Abstracts are open and close on 13th March 2015 for those interested in making a technical or industry case study presentation during the conference. Please log in to www.acaconference.com.au for further details.

Wesley Fawaz
Executive Officer
wesley.fawaz@corrosion.com.au





THE AUSTRALASIAN CORROSION ASSOCIATION INC.

TRAINING

ACA Training Calendar 2015

ACA/ACRA Corrosion and Protection of Concrete Structures

Member $1060 *Non-member $1330*

Melbourne April 28 – 29
Adelaide August 20 – 21
Perth September 1 – 2

ACA Coating Inspection Refresher

Member $605 *Non-member $740*

Adelaide November 14
New Zealand December 4

Cathodic Protection Monitoring

Member $1485 *Non-member $1810*

Brisbane March 16 – 18
New Zealand April 27 – 29
Sydney August 3 – 5
Adelaide August 31 – September 2
Perth October 5 – 7
Melbourne October 26 – 28

Cathodic Protection Advanced

Member $2220 *Non-member $2600*

Brisbane March 23 – 27
Melbourne May 25 – 29
Perth November 30 – December 4

Coating Selection and Specification

Member $1485 *Non-member $1810*

Melbourne March 2 – 4
Perth August 10 – 12

Corrosion and CP of Concrete Structures

Member $1060 *Non-member $1330*

Sydney June 10 – 11

Corrosion Technology Certificate

(Also offered as Home Study)

Member $2220 *Non-member $2600*

Perth February 16 – 20
Brisbane May 18 – 22
New Zealand June 22 – 26
Melbourne September 21 – 25
Sydney November 23 – 27

Metallurgy of Steels Introduction

Member $1485 *Non-member $1810*

Sydney July 22 – 24

NACE CIP Level 1

Member $3740 *Non-member $4275*

Sydney February 2 – 7
Brisbane February 23 – 28
Perth March 9 – 14
Adelaide April 13 – 18
Melbourne May 4 – 9
Sydney June 15 – 20
New Zealand July 6 – 11
Brisbane July 20 – 25
Perth August 17 – 22
Sydney September 7 – 12
Melbourne October 12 – 17
Adelaide November 2 – 7

All prices are in $AUD.
All courses listed include GST.
For NZ courses deduct 10%

NACE CIP Level 2

Member $3740 *Non-member $4275*

Sydney February 9 – 14
Perth March 16 – 21
Melbourne May 11 – 16
Sydney June 22 – 27
New Zealand July 13 – 18
Brisbane July 27 – August 1
Perth August 24 – 29
Melbourne October 19 – 24
Adelaide November 9 – 14

NACE CIP Level 3 Peer Review

Member $1470 *Non-member $1725*

Adelaide November 9 – 13

Protective Coatings Quality Control

Member $1485 *Non-member $1810*

Melbourne March 23 – 25
Sydney July 1 – 3
Perth September 14 – 16

SSPC Concrete Coatings Inspector Program

Level 1 $3000 *Levels 1 & 2 $3500*

Melbourne March 16 – 21

AS/NZS 2312 update published

The long awaited revision to the 2002 'Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings' was published on 19 December 2014.

The revision is now in three Parts, i.e;

AS/NZS 2312.1	*Part 1: Paint coatings*
AS/NZS 2312.2	*Part 2: Hot dip galvanizing*
AS/NZS 2312.3	*Part 3: Thermally sprayed metallic coatings (in preparation)*

All three parts are aligned with the relevant Australian and New Zealand corrosivity standards AS 4312 and NZS 3404.1.

Part 1 covers only liquid-applied paints whose main purpose is corrosion mitigation. It contains much of the information that was included in AS/NZS 2312:2002 with the following main changes. Section 5 which covered metallic coatings has been deleted, Section 7 on coating selection has been moved to Section 5, Section 8 which covered powder coatings and tapes has been edited and moved to Appendix H, and Section 13 which covered health and safety has been deleted. Part 1 has updated recommended coating systems and deleted some rarely used and problematic ones. Additional information is provided on contentious issues such as fabrication defects and warranties.

Part 2 completely replaces and updates the previous Section 5 on hot dip galvanizing (HDG) and is closely aligned to the ISO 14713 series of guides for zinc coatings. Also covered in part 2 are mechanically plated and electrodeposited coatings, and 'duplex systems' where organic paint is applied to HDG.

Part 3 (which will replace Section *5.2 Metal Spray Coatings* in AS/NZS 2312:2002) has yet to be finalised, in part due to the delay in completing the revision of ISO 2063.

For a more detailed discussion on the changes, refer to Papers 17 & 128 in the ACA *Corrosion and Prevention 2014* Conference Proceedings, i.e;

– Francis RA, '*Paint Coating Selection and Specification: Changes to AS/NZS 2312*'
– Golding P & Sheehan A, 'AS/NZS 2312.2: *A New Standard for Design of Hot Dip Galvanized Articles*'.

A fresh new look at Mattioli

At the end of 2014 Sergio, Adam and Gianni officially launched their new brand and website for 2015 at their annual Christmas get together with customers, suppliers and ourselves. Following on from moving to a brand new location just outside of Melbourne, the team have decided to give the business a rebranding and a fresh lick of paint to go with it.

2014 has been a fantastic year for this family owned business, winning new work and customers in Tasmania and NSW as well as growing their core business in Victoria they are now recognised as the innovators within protective coatings. The company have seen a drive in recruitment to grow the team, including Tony Aloi now heading up operations and a new strategy and marketing manager, Lawrence Smith. Things are looking bright for Mattioli for 2015 and we look forward to seeing some of the exciting projects up on the newsfeed in the coming months.

Check out their new website www.mattioli.com.au

Anode Engineering announces new Managing Director

Anode Engineering announced and welcomed their newly appointed Managing Director, Mr Wayne Thomson. Wayne has been active in the corrosion industry for several years and will be relocating from Auckland, New Zealand to Loganholme, Queensland as part of the transition into his new role. Anode's existing Managing Director, Wayne "Monty" Burns will be assuming the role of group chairman.

Over the past few years, Wayne Thomson has been the Market Development Manager for Australia and New Zealand for Anode Engineering Ltd in addition to managing Anode Engineering's New Zealand supply company, Lordco (CWG) New Zealand Ltd. As he commences his new role in the company, Wayne will be relinquishing his chairmanship of the Auckland division of the ACA, New Zealand Branch Committee Membership and New Zealand representation on the ACA council. He will no doubt become a familiar face in the Queensland ACA Branch.

Wayne started out in the nuclear industry as a Mechanical Engineer and subsequently went on to work in the chemical process and packaging industries. He has worked in South Africa, Italy, New Zealand and Australia and completed an MBA at Auckland University in 2007. With this experience working in a variety of countries, industries and roles, Wayne is comfortable in the industrial environment and enjoys engaging with people from all manner of backgrounds.

The team at Anode Engineering and Lordco extend a personal welcome to Wayne "Thommo" Thomson, his wife Jo and their girls and look forward to beginning the next chapter for Anode Engineering.

Coating Inspectors Thoroughly Refreshed at Petone

The eighth ACA Coating Inspection Refresher (CIR) course in NZ was held in the Opus Research training room in Petone, Lower Hutt on 28 November 2014. This was presented by Willie Mandeno on behalf of the ACA Centre. Members who had all previously attended the course in Auckland in 2009 were; Phillip Foster, Graham Porten, & Gary Smith, all from Babcock NZ Ltd., together with Anthony Heuthorst from PPG Industries. All four candidates were successful in passing the exam held at the end of the course, which covered use of inspection equipment and recent changes to the relevant Standards associated with protective coatings. The ACA is grateful to Opus Research for the use of their facilities for the day.

LOG ON & WIN!

Set up your ACA member USERNAME & PASSWORD to go into the draw to win a FREE registration to attend *Corrosion & Prevention* - ACA's annual conference, in Adelaide this year, valued at $1550

Just Loaded

Check out the latest research papers from Corrosion & Prevention 2014, Darwin in the ACA 'Library'. The library is a great resource for research and professional development.

How to Enter

1. Go to www.corrosion.com.au
2. Hit member login MEMBER LOGIN
3. Set up your username and password on the 'click here' hyperlink **Click HERE**
4. Let us know. Email *'I logged on!'* in the subject line to sbrave@corrosion.com.au stating your name and ACA member number.

***HURRY!* The LOG ON competition ends Tuesday 31 March, 2015.**

Maintenance for Mine Profitability

Mining operations and manufacturing facilities rely on the continued safe operation of vehicles and machinery to maintain profitability. Any equipment failure can be expensive in terms of lost production and cost of repairs. An estimate for the cost of lost production for a single dragline is $8000 per hour in Australia making any breakdown very costly when it might take weeks for a replacement part to be available.

As part of the technical program at the recent Australian Institute for Non-Destructive Testing (AINDT) Conference in Brisbane, Nicholas Bublitz, a Global Product Support Specialist with Olympus Scientific Solutions America (OSSA), reported on how the use of phased array ultrasonics could improve surface mine profitability.

"NDT methods like ultrasonics, eddy current and radiography—along with condition monitoring techniques such as oil and vibration analysis—play an important part in predictive maintenance programs and help reduce unexpected expenses," Bublitz said. Outage and emergency repair costs can be a significant percentage of the total operating cost of a mine. Finding a crack and repairing it before failure saves both time and money.

Phased array imaging helps identify geometric landmarks to help define the location and importance of any discontinuities. Data capture even allows for further off-line analysis. The result is more dependable, accurate and faster assessment of potential failure sites. "The use of multiple angles and imaging increases coverage, reduces scanning times, and provides better detection and characterisation capabilities especially when monitoring crack growth," Bublitz stated. "Phased array can add a huge benefit to mine predictive maintenance programs and in turn increase profitability."

"With state of the art technologies and a comprehensive range of instrumentation available, we can supply equipment for a wide range of non-destructive testing applications to a variety of industries," said Richard Nowak, NDT Product Specialist at Olympus. "We are committed to the development of new technologies, products, and services that offer the best solutions to meet the needs of our customers."

Proudly Presented by:

Sponsors:

Supported by:

Corrosion Management Experiences in the Water & Wastewater Industry

26 March 2015 • Melbourne

Overview

Australia is the driest inhabited continent on Earth, and amongst the world's highest consumers of water. Amongst OECD nations Australia is ranked fourth-highest in water usage per capita. Australia faces increasingly acute long-term water shortages with lower rainfall, rivers drying up and dam water levels falling. The total estimated cost of corrosion in the Australian Urban Water Industry is an estimated annual cost of approximately $AUD982 million.

The Water & Water Treatment Technical Group of the ACA has produced a technical program that will investigate and discuss ways of protecting and maintaining our water assets from corrosion. To ensure this event is a success and to bring the industry together, we will have industry experts from each of the following industry groups presenting various real life case studies and asset management solutions:

• Asset Owners • Consultants • Contractors • Suppliers

This one day event will bring together all stakeholders to discuss various corrosion issues and their management across the water & wastewater industries. To end the day we will engage the audience to participate in an open forum to discuss your concerns with corrosion affecting you with the panel of speakers.

Time	Session	Speaker
8.30 – 8.55	***Registration***	
8:55 – 9:00	**Welcome and Seminar Opening**	
9.00 – 9.40	Current State of Play for the Australian Water Industry	Greg Ryan, Water Services Association of Australia
9.40 – 10.20	Using Failure Data to Provide Insights to Water Main Condition and Corrosion Mechanisms	Phil Hart, Melbourne Water
10.20 – 10.50	***Morning Tea***	
10.50 – 11.30	Corrosion and Materials Selection at Wastewater Treatment Plants	Sarah Furman, AECOM
11.30 – 12.10	Case Study: Eastern Treatment Plant, Melbourne Water - Retrofitting 'Off the Shelf' Products for Better Outcomes	Gianni Mattioli, Mattioli Bros
12.10 – 12.50	Underside Corrosion in Steel Storage Tanks in the Water Industry	Joe Pavia, International Paint
12.50 – 13.40	***Lunch***	
13.40 – 14.20	Advanced Materials in Desalination Plants	David Parravicini, Degremont
14.20 – 15.00	Corrosion Mechanisms in Sewers and Rehabilitation Options	Chris Weale, GHD
15.00 – 15.30	***Afternoon Tea***	
15.30 – 16.10	Protecting Australia's Water Industries Assets	Michael Harrington, McElligotts
16.10 – 16.50	Field Testing Methods and Condition Monitoring Technology for Concrete in Water Infrastructure	William Ward, PCTE
16.50 – 17.25	Open Floor Speakers Forum and Discussion	
17.25 – 17.30	**Seminar Close**	
17.30 – 19.00	**Cocktail Function**	

Venue

Melbourne Marriott Hotel
Cnr Lonsdale & Exhibition Streets
Melbourne VIC 3000

Contact

For further information on this event please contact Brendan Pejkovic on +61 (0)3 9890 4833 or via email at bpejkovic@corrosion.com.au

Update on Standards New Zealand

The New Zealand Government made a decision last year that would see the Standards Council disestablished and a new standards body established within the government agency, the Ministry of Business, Innovation and Employment. Legislation was necessary to allow this to happen and in July, the Standards and Accreditation Bill was introduced to Parliament. The Bill received its first reading in Parliament on 4 November and was referred to the Commerce select committee, which is now calling for public submissions. Submissions are due to the committee by 15 January 2015, and the committee is expected to report back to Parliament on the Bill by 31 March 2015.

Until the Bill is passed into law, Standards New Zealand remains New Zealand's national standards body, responsible for developing, publishing, promoting, and providing access to standards that meet the needs of New Zealand society and business. There is more information on the Standards New Zealand website.

Over half of Standards Australia's publications last year were joint Standards developed with New Zealand. In November 2014, Standards Australia reaffirmed their strong working ties with Standards New Zealand by signing a Memorandum of Understanding to continue their close partnership in developing joint standards. Their partnership with New Zealand is expected to continue.

The long-awaited revisions to AS/NZS 2312:2002 were published 19 Dec 2014, and are now available for purchase on-line from Standards Australia or Standards New Zealand.

Prof David Williams Recipient of the U.R.Evans Award 2014

Congratulations to Professor David Williams for having been named as the 2014 recipient of the U.R. Evans Award, which is the top international award of the UK Institute of Corrosion. It was first awarded in 1976 and is made for outstanding International Achievements in pure or applied corrosion science.

This award consists of a mounted sword on an engraved plaque. The recipient also receives an Honorary Life Fellowship of the Institute. He will receive the sword next September and we are looking forward to seeing the sword prominently displayed!

Recent recipients include:

- 2013 Prof. J Scully (University of Virginia)
- 2012 Prof. M Schütze (Dechema, Frankfurt)
- 2011 Prof. G Frankel (Ohio State University)
- 2010 Prof. P Marcus (CNRS, Paris)
- 2009 Prof. C Leygraf (KTH, Stockholm)
- 2008 Prof. D Young (University of New South Wales)

Introductory Corrosion Seminar

Protective Coatings & Cathodic Protection

Proudly presented by:

Sponsored by:

Thursday 30th July 2015

Melbourne - Hotel Mercure
13 Spring Street,
Melbourne VIC

Sydney - Engineers Australia
Sydney Division, 8 Thomas St
Chatswood NSW

Presenters:

Melbourne: Robert Francis, David Reilly & Wayne Burns

Sydney: Fred Salome, Alex Spillett & Allan Sterling

Overview of Program:

The ACA is holding this one day seminar to investigate the basic concepts of both protective coatings and cathodic protection. This seminar is aimed at people starting off in the corrosion industry or those wanting a refresher.

9:00am – 12:30pm

Protective Coatings (includes 30 min morning tea)

This session provides an introduction to basic concepts of protective coatings; including the various types of coatings, the inspection requirements and considerations when selecting such products.

This session is designed for those working outside the corrosion or protective coatings industry, such as engineers and architects, but would be suitable for anyone requiring a brief introduction to the subject. Attendees will have the opportunity to raise questions and discuss issues and experiences.

Highlights:

- Types of Coatings
- Coating Inspection
- Coating Maintenance
- Coating Selection

12:30pm – 1:30pm

LUNCH

1:30pm – 2:00pm

Introduction to Galvanizing

See how hot dip galvanizing is applied and learn about the benefits of this trusted, proven performer. Illustrated with everyday examples, this session will provide attendees with an overview of the galvanizing process as well as an awareness of situations where galvanizing can be used.

2:00pm – 5:30pm

Cathodic Protection (includes 30 min afternoon tea)

This session will cover the basic corrosion theory and the principles and monitoring methods used in cathodic protection followed by a demonstration of cathodic protection.

The session will enable participants to develop an awareness of the importance of cathodic protection to the maintenance and management of assets and an understanding of the basic principles of corrosion and cathodic protection.

Highlights:

- Cathodic Protection
- Measurement Equipment
- Field Measurement Techniques
- Cathodic Protection Demonstration

Registration: $150 (Including GST).
Please register online via the website at www.corrosion.com.au
Registration includes, arrival tea & coffee, morning/afternoon tea and lunch.
Handouts from the Seminar will be available in a hard copy booklet.

For further information about this seminar please contact Brendan Pejkovic on +61 3 9890 4833 or via email at bpejkovic@corrosion.com.au

ACA Welcomes New Members

Corporate Silver

W.A Stroud Limited
(www.strouds.co.nz)

W A Stroud Limited are specialists in the specification, supply and service of coating and application equipment to industry. Stroud's cover the full range of finishing (airless, air-assisted and air-spray) as well as specialist coatings such as Line-striping, PFP and Polyurea. If you need to move, mix, meter and dispense a single or plural component product, wet or powder, W A Stroud Ltd are able to assist.

Abrasiflex
(www.abrasiflex.com.au)

Abrasiflex is one of Australia's leading independent suppliers of industrial abrasive products. Their comprehensive range of products includes all types of coated and bonded abrasives as well as abrasive blast.

New Individual & Student Members

Type	Name	Surname	Company	Branch
Individual	Mohammed	Abbas	Static Equipment Group	VIC
Student	Ahmed	Almunasif	Queensland University of Technology	QLD
Individual	Paul	Bennett		QLD
Individual	Matt	Bradley	Technosol Ltd	NZ
Individual	Michael	Docherty		WA
Individual	Nathaniel	Everist	Cape PLC	WA
Individual	Richard	Fleming		QLD
Individual	Alex	Hamilton		VIC
Individual	Richard	Holmes	Zone Architectural Products	NZ
Individual	Martin	Jensen	Den-Jet Australia Pty Ltd	SA
Individual	Luke	Jerrick		QLD
Individual	Alex	Karelin	BHP Billiton	QLD
Individual	Ivan	King	ConocoPhillips	WA
Individual	John	Knight	Drury Construction Ltd	NZ
Individual	Stewart	Long	CDMS Consulting Engineers	WA
Individual	Gary	Lord	Laing O'Rouke	WA
Individual	Eva	Martyniuk	Apache Energy Ltd	WA

Type	Name	Surname	Company	Branch
Individual	Luke	Mills		NSW
Individual	Brendan	Morgan		WA
Individual	David	Nixon	BMA Coal	QLD
Individual	Nicholas	Oats		QLD
Individual	Brad	Patton	Geelong Galvanizing	VIC
Individual	Sean	Ramsay		WA
Individual	Brett	Redman	Sulphuric Acid Services Pty Ltd	WA
Individual	Clayton	Rocko	Blue Collar Productions Pty Ltd	QLD
Individual	Gavin	Rogers	Bechtel Australia	QLD
Individual	Julian	Rutherford	GPR Corrison Protection	WA
Individual	Stephen	Scott		WA
Individual	Damien	Southall	Chiyoda	VIC
Individual	Norbert	Szymiczek		QLD
Individual	Joshua	Talbot	BG Group	SA
Individual	Pranon	Thiwwohan	WICET	AA
Individual	Steven	Webley	UGL Kaefer	VIC
Individual	Scott	Whelan		QLD
Individual	Aimee	Williams	Rosen Group	WA
Student	Caizhen	Yao	University of Auckland	NZ

Protective Coatings Preventing Corrosion

19 March 2015

Adelaide

SPONSORED BY:

galvanizers ASSOCIATION OF AUSTRALIA

International

PROUDLY PRESENTED BY:

Australasian Corrosion Association Inc.

Overview

Protective coatings are used across a multitude of industries including construction, infrastructure, oil and gas, and mining. Protective coatings are a widespread and extremely effective approach to controlling and preventing corrosion. The longevity of protective coatings varies enormously with modern protective coatings capable of providing very high levels of corrosion protection and durability even in the most extreme environments.

The event will bring industry experts together to share their knowledge and investigate ways to better improve the longevity of protective coatings in a variety of applications and environments. The aim is to explore the protective coatings industry by looking at case studies, new technologies, environmental considerations and industry qualifications, standards and training.

If you are interested in corrosion prevention then this event is a great opportunity to get together with your industry colleagues and learn about the latest in the protective coatings industry.

Venue

Mercure Grosvenor Hotel Adelaide
125 North Terrace,
Adelaide SA

Contact

For further information on this event please contact Brendan Pejkovic on +61 (0)3 9890 4833 or bpejkovic@corrosion.com.au

Program

Time	Session	Speaker
8.30 – 9.00	Registration	
9.00 – 9.10	Welcome and Seminar Opening	
9.00 – 9.40	Compliance of Structural Steel Fire Protection with Intumescent Coatings	Chris Partington, International Paint
9.40 – 10.20	Specifications for Corrosion Management Using Coatings - Does It Have To Be So Complicated?	Dennis Richards, DM Richards Consulting Services
10.20 – 10.50	Morning Tea	
10.50 – 11.30	TBC	TBC
11.30 – 12.10	Coating Selection and Performance in Water Industry Applications	Danny London, SA Water
12.10 – 13.00	Lunch	
13.00 – 13.40	A Guide to AS/NZS2312.1 (2014) Paint Coatings – What Is It & Why You Need To Tell Your Customers About It	Kingsley Brown, Incospec & Associates
13.40 – 14.20	A Guide to AS/NZS2312.2 (2014) Hot Dip Galvanizing – What Is It & Why You Need To Tell Your Customers About It	Peter Golding, Galvanizers Association of Australia
14.20 – 14.50	Afternoon Tea	
14.50 – 15.30	Don't Let Your Pull Go to Waste, Use the Right Glue – Test Results for Glues Used for Adhesion Testing to AS 3894.9 Method C	Kingsley Brown, Incospec & Associates
15.30 – 16.10	Considerations When Selecting Long Term Protective Coatings	David Towns, Denso Australia
16.10 – 16.50	Open Floor Speakers Forum and Discussion	
16.50 – 17.00	Seminar Close	
17.00 – 18.30	Cocktail Function	

ACA New Plymouth Division

The ACA New Zealand Branch has been actively promoting and supporting activities in 2014, not only in Auckland and Wellington, but also Christchurch and New Plymouth. This has been manifested in the establishment in regular technical activities in Christchurch and the resurgence in activities in New Plymouth. 2014 has ended with a successful Technical meeting at the Snug Lounge in the centre of New Plymouth. The venue was indeed snug not only due to the name, but the fact that 40 odd keen corrosionists squeezed into the venue. This is fantastic news for the New Zealand Branch. The committee are motivated to ensure a successful 2016 ACA conference in New Zealand and want to get the message out the full length and breadth of New Zealand. With the Christchurch rebuild and with New Plymouth being the oil and gas centre of New Zealand, this is timely.

The ACA centre assisted with arranging the speakers, venue, marketing and registrations. The attendees enjoyed 3 technical talks. Firstly, Andrew Webb from Carboline / Altex Coatings spoke on the different coatings technologies and various testing regimes. This included a detailed explanation of how cathodic disbondment tests on coatings are performed. The next speaker was Neil Pain from Rosen who explained the different methods of measuring faults in pipelines with varying pig systems. Due to lower supply pressures from depleting wells, increasingly complex intelligent pig systems are required. New developments to adapt to this challenge include self-driven pigs.

Lastly, Sean Ryder from Phoenix Solutions and Graeme Gummow from G² Consulting explained the effects of AC current on pipelines and how associated corrosion mechanisms work. The presentation included some animated demonstrations of AC current from Graeme. The audience will forever associate the AC effects on pipelines with flying arms and dancing, possibly not out of place at an 'AC/DC' concert!

With the able direction of the night's MC, Jaco from Carboline, the speakers managed to answer several questions before the formalities finished on time. The majority of the speakers and delegates stayed behind for some refreshments and fellowship. With the support of the night's sponsors, NZ Inspection Rentals, Carboline and the ACA, the evening could well and truly be considered a success. Importantly, the demand for regular events in 2015 was established and with the momentum generated thus far, the ACANZ New Plymouth Division is set to flourish!

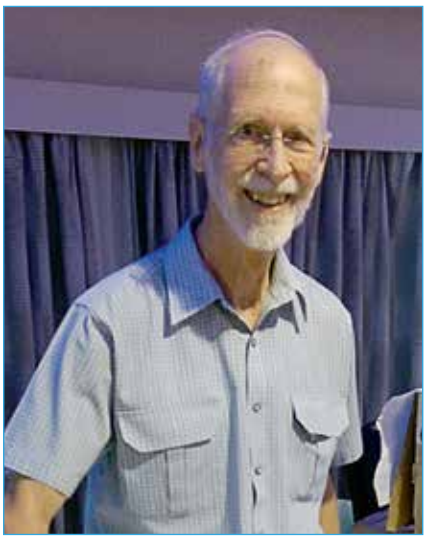
ACA Life Member

Graham Wright is a Life Member with the Auckland Division of the NZ Branch. He is pictured here with his 50+ year membership plaque.

Retired since 2000, Assoc Prof Dr Graham Wright (Auckland Uni Chemical Sciences Dept) was one of the original members of the ACA NZ Branch Committee back in the 1960-1970s. He has been a stalwart of the ACA NZ Branch in his 50 years membership.

Graeme Kelly Retirement

The ACA would like to congratulate Graeme Kelly on his retirement. Graeme has been in the Corrosion Industry for 30 years!



The ACA would like to thank Graeme for all of his hard work throughout his time lecturing for the ACA.

ACA 2014 Branch Events

The ACA Branches organised a grand total of 58 events during 2014 attracting 2269 delegates.

The raft of technical and social events provided ACA members and participants with opportunities to grow both their knowledge and contact bases in a relaxed and friendly atmosphere.

A summary of Branch activity:

- Newcastle: 7 events with 192 attendees
- New South Wales: 4 events with 146 attendees
- New Zealand: 13 events with 235 attendees
- Queensland: 5 events with 91 attendees
- South Australia: 7 events with 329 attendees
- Tasmania: 4 events with 134 attendees
- Victoria: 10 events with 625 attendees
- Western Australia: 8 events with 517 attendees

ACA Standards Update

Welcome to the first corrosion related standards report for 2015.
The standards reporting for 2015 is scheduled against Technical Groups (TG) as indicated below:

Issue 2015	Standards search for TG interests
Feb	Concrete Structures & Buildings
April	Coatings
June	Petroleum & Chemical Process Industries

Issue 2015	Standards search for TG interests
August	Cathodic Protection
October	Mining Industry
December	Water & Waste Water

This Standards report focuses on concrete related corrosion for the Concrete Structures & Buildings Technical Group.

As previously in Focus 1 we will, where possible, list all standards relevant to the technical group in question; sometimes this will not be possible (for example for coatings and paints) but will focus on those standards of most critical import. We bring the new standards update into this Focus; these will be listed as Focus 1A and Focus 1B reports.

Focus 1A
As previously the focus will be a global standards and publication focus, searching through SAIGLOBAL Publications at https://infostore.saiglobal.com/store, for all current publications and standards relating to the ACA technical Groups, with this editions group focuses being the "**Concrete Structures and Buildings" Technical Group**.

These results are shown in **Focus 1A** listing below.

Focus 1B
A SAI Global search, as previously, at http://www.saiglobal.com/online/ for new standards, amendments or drafts for AS, AS/NZS, EN, ANSI, ASTM, BSI, DIN, ETSI, JSA, NSAI and standards and amendments for ISO & IEC published from **24 October 2014 to 16 January 2015**, using the key words and key word groups:

- 'durability'.
- 'corrosion' or 'corrosivity' or 'corrosive'; but not 'anodizing' or 'anodize(d)'.
- 'paint' or 'coating'; but not 'anodizing' or 'anodize(d)'.
- 'galvanize' or 'galvanized' or galvanizing'.
- 'electrochemical' or 'electrolysis' or 'electroplated'.
- 'cathode' or 'cathodic'.
- 'anode' or 'anodic'.
- 'corrosion' and 'concrete' or 'concrete' and 'coatings'.

These results are shown in **Focus 1B** listing below

Focus 1A Report on SAIGLOBAL Publications at https://infostore.saiglobal.com/store, for all current publications and standards relating to "**concrete and corrosion**" for the "Concrete Structures and Buildings" Technical Group, a **total of 165 publications, up one from 164 publications this time last year** were found. See a summary in Table 1 on page 23.

As previously there were no reference to AS, AS/NZS publications but one to BRANZ (Building Research Association of New Zealand); BRANZ Bulletin 464 Preventing Corrosion of Reinforcing Steel in Concrete.

A filter for ASTM gave 10 publications, whilst one for NACE gave 6 and one for American Concrete Institute gave 4; these results are shown below.

Summary of the Filter Searches

- ASTM STP1065-90 - Corrosion Rates of Steel in Concrete
- ASTM STP1276-96 - Techniques to Assess the Corrosion Activity of Steel Reinforced Concrete Structures
- ASTM STP629-77 - Chloride Corrosion of Steel in Concrete
- ASTM STP713-80 - Corrosion of Reinforcing Steel in Concrete
- ASTM STP818-83 - Corrosion of Metals in Association with Concrete
- ASTM STP906-86 - Corrosion Effect of Stray Currents and the Techniques for Evaluating Corrosion of Rebars in Concrete
- ASTM C1582/C1582M-11 - Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete
- ASTM G109-07(2013) - Standard Test Method for Determining Effects of Chemical Admixtures on Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments
- ASTM G180-13 - Standard Test Method for Corrosion Inhibiting Admixtures for Steel in Concrete by Polarization Resistance in Cementitious Slurries
- ASTM C876-09 - Standard Test Method for Corrosion Potentials of Uncoated Reinforcing Steel in Concrete
- NACE 05107:2007 - Report on Corrosion Probes in Soil or Concrete
- NACE SP 01 87:2008 - Design Considerations for Corrosion Control of Reinforcing Steel in Concrete
- NACE SP 03 08:2008 - Inspection Methods for Corrosion Evaluation of Conventionally Reinforced Concrete Structures
- NACE SP 03 90:2009 - Maintenance and Rehabilitation Considerations for Corrosion Control of Atmospherically Exposed Existing Steel-reinforced Concrete Structures
- NACE SP 01 12:2012 - Corrosion Management of Atmospherically Exposed Reinforced Concrete Structures
- NACE SP 01 00:2014 - Cathodic Protection to Control External Corrosion of Concrete Pressure Pipelines and Mortar-Coated Steel Pipelines For Water or Waste Water Service
- ACI 222.3R:2011 - Guide to Design and Construction Practices to Mitigate Corrosion of Reinforcement in Concrete Structures
- ACI 222R:2001 (R2010) - Protection of Metals in Concrete Against Corrosion
- ACI SP 291 CD:2013 - Corrosion of Reinforcing Steel in Concrete - Future Direction: Proceedings - Hope & Schupack Corrosion Symposium CD
- ACI C 25:1993 - Concrete Durability: Corrosion Protection

Table 1.
Title search by publisher with keywords 'concrete and corrosion' – 165 publications found
A total of 165 Publications were found with 0 references to AS, AS/NZS publications.

Results by publisher	
Polish Committee for Standardization	15
Asociacion Espanola de Normalizacion	11
Association Francaise de Normalisation	11
Italian Standards	10
American Society for Testing and Materials	9
Belgian Standards	7
British Standards Institution	7
Comite Europeen de Normalisation	7
Danish Standards	7
German Institute for Standardisation (Deutsches Institut für Normung)	7
National Association of Corrosion Engineers	7
National Standards Authority of Ireland	7
Nederlands Normalisatie Instituut	7
Norwegian Standards (Norges Standardiseringsforbund)	7
Osterreichisches Normungsinstitut	7
Standardiserings-Kommissionen I Sverige	7
Swiss Standards	7
Interstandard (Russia)	6
Korean Standards Association	6
American Concrete Institute	4
American Association of State Highway and Transportation Officials	2
Japanese Standards Association	2
BRANZ	1
Bureau of Indian Standard	1
DVS-VERLAG GmbH, Verlag für Schweissen und verwandte Verfahren	1
The Society for Protective Coatings	1
Wirtschafts und Verlagsgesellschaft Gas und Wasser	1
Results by subject - Construction materials and building – 110 results	
Construction materials	57
Structures of buildings	47
Protection of and in buildings	5
Elements of buildings	1
Results by subject - Manufacturing engineering – 29 results	
Surface treatment and coating	29
Results by subject - Metallurgy – 15 results	
Corrosion of metals	10
Iron and steel products	5
Results by subject - Generalities. Terminology. Standardization. Documentation – 4 results	
Vocabularies	4
Results by subject - Testing – 2 results	
Environmental testing	2
Results by subject – Civil Engineering – 1 results	
Bridge Construction	1

Focus 1B - SAI Global, search at http://www.saiglobal.com/online/ for new standards, amendments or drafts for AS, AS/NZS, EN, ANSI, STM, BSI, DIN, ETSI, JSA, NSAI AND standards and amendments for ISO & IEC, ALL published from 24 October 2014 to 16 January 2015.

This produced 50 Documents as listed below. There was 2 AS/NZS Standards being the update of AS/NZS2312, now in two parts;

- AS/NZS 2312.1:2014 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Paint coatings
- AS/NZS 2312.2:2014 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Hot dip galvanizing

New standards, amendments or drafts for AS, AS/NZS, EN, ANSI, ASTM, BSI, DIN, ETSI, JSA, NSAI and Standards or Amendments for ISO & IEC PUBLISHED between 24 October 2014 to 16 January 2015	
Key word search on 'durability'.- 4 citations found; indirectly corrosion related; 0 for AS/ASNZS	
ISO/DIS 22975-1	Solar energy - Collector components and materials - Part 1: Evacuated tubes - Durability and performance
ISO/DIS 22975-2	Solar energy - Collector components and materials - Part 2: Heat-pipe for solar thermal application - Durability and performance
ISO/DIS 19862	Buildings and civil engineering works - Sealants - Durability to extension compression cycling under accelerated weathering
14/30312373 DC BS EN 350	Durability of Wood and Wood-Based Products - Testing and Classification of the Resistance to Biological Agents, the Permeability to Water and the Performance of Wood and Wood-Based Materials
Key word search on 'corrosion' or 'corrosivity' or 'corrosive'; but not 'anodizing' or 'anodize(d)'- 21 citations found; one from AS or AS/ASNZ being the two parts of the revised AS/NZS 2312 .	
AS/NZS 2312.1:2014	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Paint coatings
AS/NZS 2312.2:2014	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings-Hot dip galvanizing
ISO 7441:2015	Corrosion of metals and alloys - Determination of bimetallic corrosion in atmospheric exposure corrosion tests
ISO/FDIS 17093	Corrosion of metals and alloys - Guidelines for corrosion test by electrochemical noise measurements
ISO/FDIS 17945	Petroleum, petrochemical and natural gas industries - Metallic materials resistant to sulfide stress cracking in corrosive petroleum refining environments
ISO/FDIS 18069	Corrosion of metals and alloys - Method for determination of the uniform corrosion rate of stainless steels and nickel based alloys in liquids
ISO/DIS 4623-2	Paints and varnishes - Determination of resistance to filiform corrosion - Part 2: Aluminium substrates
ISO/FDIS 8044	Corrosion of metals and alloys - Basic terms and definitions
I.S. EN 10088-2:2014	Stainless Steels - Part 2: Technical Delivery Conditions for Sheet/plate and Strip of Corrosion Resisting Steels for General Purposes
I.S. EN 10088-3:2014	Stainless Steels - Part 3: Technical Delivery Conditions for Semi-finished Products, Bars, Rods, Wire, Sections and Bright Products of Corrosion Resisting Steels for General Purposes
I.S. EN 16602-70-20:2014	Space Product Assurance - Determination of the Susceptibility of Silver-plated Copper Wire and Cable to 'red-plague' Corrosion
I.S. EN 16602-70-36:2014	Space Product Assurance - Material Selection for Controlling Stress-corrosion
I.S. EN 16602-70-37:2014	Space Product Assurance - Determination of the Susceptibility of Metals to Stress-corrosion Cracking
DIN EN 10088-2 (2014-12)	Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes
DIN EN 10088-3 (2014-12)	Stainless steels - Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes
DIN EN ISO 8044 (2015-02) (Draft)	Corrosion of metals and alloys - Basic terms and definitions (ISO/FDIS 8044:2014); Trilingual version FprEN ISO 8044:2014
BS EN 10088-2:2014	Stainless Steels - Part 2: Technical Delivery Conditions For Sheet/Plate And Strip Of Corrosion Resisting Steels For General Purposes
BS EN 10088-3:2014	Stainless Steels - Part 3: Technical Delivery Conditions For Semi-Finished Products, Bars, Rods, Wire, Sections And Bright Products Of Corrosion Resisting Steels For General Purposes

BS EN 16602-70-20:2014	Space Product Assurance - Determination Of The Susceptibility Of Silver-Plated Copper Wire And Cable To "Red-Plague" Corrosion
BS EN 16602-70-36:2014	Space Product Assurance - Material Selection For Controlling Stress-Corrosion Cracking
BS EN 16602-70-37:2014	Space Product Assurance - Determination Of The Susceptibility Of Metals To Stress-Corrosion Cracking
Key word search on 'paint' and or 'coating'; but not 'anodizing' or 'anodize(d)' or corrosion– 24 relevant Publications found; one from AS/NZS being the paint section of AS/NZS 2312.	
AS/NZS 2312.1:2014	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Paint coatings
ISO/DIS 4623-2	Paints and varnishes - Determination of resistance to filiform corrosion - Part 2: Aluminium substrates
ISO/DIS 4629-1	Binders for paints and varnishes - Determination of hydroxyl value - Titrimetric method - Part 1: Titrimetric method without using a catalyst
ISO/DIS 4629-2	Binders for paints and varnishes - Determination of hydroxyl value - Part 2: Titrimetric method using a catalyst
I.S. EN ISO 13803: 2014	Paints and Varnishes - Determination of Haze on Paint Films at 20 Degrees (iso 13803:2014)
I.S. EN 16602-70-31:2014	Space Product Assurance - Application of Paints and Coatings on Space Hardware
I.S. EN ISO 2813:2014	Paints and Varnishes - Determination of Gloss Value at 20 Degrees, 60 Degrees and 85 Degrees (iso 2813:2014)
I.S. EN ISO 4618:2014	Paints and Varnishes - Terms and Definitions (iso 4618:2014)
DIN EN 15457 (2014-11)	Paints and varnishes - Laboratory method for testing the efficacy of film preservatives in a coating against fungi
DIN EN 15458 (2014-11)	Paints and varnishes - Laboratory method for testing the efficacy of film preservatives in a coating against algae
DIN EN ISO 17463 (2014-11)	Paints and varnishes - Guidelines for the determination of anticorrosive properties of organic coatings by accelerated cyclic electrochemical technique (ISO 17463:2014)
DIN EN ISO 4618 (2015-01)	Paints and varnishes - Terms and definitions (ISO 4618:2014); Trilingual version EN ISO 4618:2014
DIN EN 927-2 (2014-11)	Paints and varnishes - Coating materials and coating systems for exterior wood - Part 2: Performance specification
BS EN ISO 13803:2014	Paints And Varnishes - Determination Of Reflection Haze On Paint Films At 20
14/30290247 DC Bs X38:2005 + A1	Heat Curing Paint Scheme For Aerospace Purposes - Specification
BS EN 16602-70-31:2014	Space Product Assurance - Application Of Paints And Coatings On Space Hardware
BS EN ISO 2813:2014	Paints And Varnishes - Determination Of Gloss Value At 20 Degrees, 60 Degrees And 85 Degrees
BS EN ISO 4618:2014	Paints And Varnishes - Terms And Definitions (Iso 4618:2014)
ISO 12736: 2014	Petroleum and natural gas industries - Wet thermal insulation coatings for pipelines, flow lines, equipment and subsea structures
ISO 21809-2:2014	Petroleum and natural gas industries - External coatings for buried or submerged pipelines used in pipeline transportation systems - Part 2: Single layer fusion-bonded epoxy coatings
ISO/DIS 2178	Non-magnetic coatings on magnetic substrates - Measurement of coating thickness - Magnetic method
ISO/FDIS 27307	Thermal spraying - Evaluation of adhesion/cohesion of thermal sprayed ceramic coatings by transverse scratch testing
I.S. EN 14901:2014	Ductile Iron Pipes, Fittings and Accessories - Epoxy Coating (heavy Duty) of Ductile Iron Fittings and Accessories - Requirements and Test Methods
AWWA D102:2014	Coating Steel Water-Storage Tanks
Key word search on 'galvanize' or 'galvanized' or galvanizing' – 1 Standard Publications found; the updated Part 2 of AS/NZS2312.	
AS/NZS 2312.2:2014	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings-Hot dip galvanizing
Key word search on 'corrosion' and 'concrete' or 'concrete' and 'coatings' – 0 Standard Publications found	
Key word search on 'cathode' or 'cathodic' - 0 publications found; 0	
Key word search on 'anode' or 'anodes' or 'anodic' – 0 Standard Publications found	
Keyword Search on 'anodize' or 'anodized' - 0 Publications found	

Arthur Austin
ACA Standards Officer

NEW PRODUCT SHOWCASE

The ACA does not officially endorse any of the products advertised in *Corrosion & Materials*.

New Sonatest Flaw Detector Series

Sonatest has released its next generation Sitescan and Masterscan series of flaw detectors. New features provide flexibility to customise the instrument exactly as is needed. All units are now field upgradeable, so the adaptability of Sonatest's Flaw Detectors can be increased over time.

The new range comprises of just four models the Sitescan 500S and D-50 - offering entry level broadband UT performance. The Masterscan 700M and the D-70 have 8 filter settings from 100kHz to 22MHz, with 100-450V square wave transmitter and 20 metre range, giving the highest specification Flaw Detector in the market.

These models come in 2 shapes allowing you to select between traditional table-top style or the more recent hand-held portable D Series case with the rotary wheel menu driver.

Software options across the range include TCG, DGS(AVG), AWS, API, Interface Trigger, Backwall Echo Attenuation, Split DAC, Corrosion Software and Dryscan modules.

For more information on the new Sonatest Flaw Detector range contact Russell Fraser Sales today:

T: +612 9545 4433 | F: +612 9545 4218
E: rfs@rfsales.com.au
Web: www.rfsales.com.au

ACA Foundation Ltd.

Advancing corrosion mitigation through education

Note from the Chairman

2014 was another outstanding year in the life of the ACA Foundation Ltd.

In this issue are a number of reports from scholarship recipients who have recently travelled the world contributing to corrosion conferences, participating in site visits, meeting with global suppliers and attending university research laboratories.

The 2014 ACA Foundation Scholarship Program was an outstanding success. ACA Foundation Ltd has now awarded 87 scholarships over the last 3 years, including supporting 60 participants to attend the Future Leaders Forum.

2015 will see the Foundation release its annual Scholarship Program as well as the launch of the ACA Foundation Ltd. Business Plan. The three (3) year Plan will see the ongoing support of the scholarship program, the development of a secondary school corrosion resource, development of a corrosion related education project in the broader community and diversification of the Foundation's income streams.

The Foundation Board with assistance from ACA staff continues to develop programs and projects to support the work of corrosion mitigation through education in Australasia. All this work has been made possible due to the generosity of Foundation donors, to whom I would like to extend my deepest thanks.

Dean Wall,
Chairman
- ACA Foundation.

International Travel Scholarship

In November 2013, Dean Ferguson was awarded one of the inaugural ACA Foundation International Travel Scholarship's (now the Brian Cherry International Travel Scholarship).

Dean Ferguson

It was a colleague who suggested I apply for the International Travel Scholarship. 'How can you pass up such an opportunity?' he asked, and he was right, the ACA Foundation Scholarship was a once in a lifetime opportunity. But the problem I faced was, where do I start, and what activities were truly worthy of this scholarship? The stated aim of the International Travel Scholarship was '*to attend international conferences and undertake other activities of benefit to the broader corrosion community*.'

This article outlines the activities that I undertook as part of my trip; the people I met, companies I visited and, unfortunately, too few of the papers I saw presented (any attempt to document them all would fall short).

For the first activity of the trip I was fortunate enough to be invited to spend a week working with the team at Concrete Preservation Technologies (CPT) in Nottingham, UK. A number of CPT staff (including Dr Gareth Glass and Dr Nigel Davison) have connections within Australia and have presented at previous Corrosion and Prevention Conferences. In Australia, CPT is best known as the manufacturer of cathodic protection system components (anodes and monitoring electrodes). CPT undertakes in-house manufacture of many of their

continued over…

"I would like to thank the ACA Foundation for their support in my attendance at the 2014 Corrosion & Prevention Conference."
Ashleigh Trainor, Santos

components, and it was a fantastic opportunity to witness this process first hand. In addition, CPT is actively involved in ongoing research and the development of new products, some of which I suspect we will see introduced to Australia in the near future.

As well as product design and manufacture, in the UK the CPT team also undertakes design of remediation systems using their products. During my time at CPT the team were assisting with the installation of an in-house designed system for the remediation of a severely corroded pre-stressed reinforced concrete bridge.

After my first week in the UK, I was ready to begin back to back conferences, Concrete Solutions 2014 and EuroCorr 2014.

Concrete Solutions 2014, the 5th International Conference on Concrete Repair, was held at the spectacular Queen's University in Belfast, Ireland. A three day conference with over 110 papers presented across a broad range of concrete repair topics, the conference was both well run and well attended. A small exhibition provided an opportunity to review the latest European concrete NDT equipment.

I was fortunate to be able to present a paper I had co-authored with Dr. Chris Weale, GHD, titled 'Development and Use of Flowable Calcium Aluminate Mortars in Sewer Environments'. This paper was a case study discussing the use of novel materials for a complicated waste water drop structure remediation project.

One of the highlights was the paper 'Site Performance of Galvanic Anodes in Concrete Repairs' by C. Christodoulou (AECOM Europe) and C.I. Goodier & S.A. Austin (Loughborough University) which reviewed and compared the performance of discrete galvanic anodes installed within both the repair material and parent concrete in full-scale reinforced concrete structures. Their results indicate that galvanic anodes installed within the parent concrete had a more profound effect on the polarisation of the steel around the perimeter of the patch repair.

Another interesting paper was 'Field Experience of Remote Monitored and Controlled CP Systems' by C. Atkins, R. Brueckner & P. Lambert (Mott MacDonald) and M. Bennett (Halton Borough Council) who presented a review of the performance of a series of cathodic protection systems and the associated control equipment which were installed on the approach viaducts of a major UK bridge structure over a twenty year period. The challenges of 'legacy issues' inhibiting the monitoring and operation of cathodic protection, and lessons learnt for future designs were very applicable to cathodic protection system design in Australia.

It is difficult to limit this section to mention only a few papers, as the three days was packed full of enjoyable, and valuable, presentations. I can only encourage others to find a copy of the proceedings, or even make the journey to Concrete Solutions 2016.

Eurocorr 2014, the European Corrosion Congress, was as different from Concrete Solutions as two corrosion related conferences could be. Held in Pisa, Italy, Eurocorr 2014 featured in excess of 600 papers presented in up to ten simultaneous presentation streams across five days. The topics of the streams were diverse, ranging from corrosion in aerospace applications to inorganic/organic/metallic coatings and from heavy industry related themes (high temperature, refinery, nuclear corrosion) to corrosion of archaeological and historical artefacts.

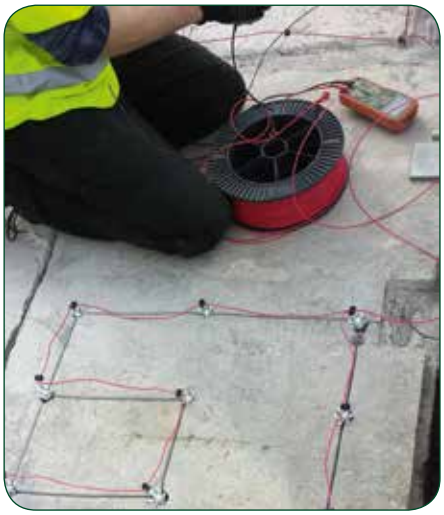
A paper entitled 'Coating Deterioration and Corrosion on Offshore Wind Power Structures: A Review of Inspection Results', presented by A. Momber (Muehlhan AG) was a well-illustrated guide to the importance of considering durability in design. In many instances, the arrangement and alignment of the structural components was observed to contribute directly to coating deterioration and corrosion or hamper efforts for inspection and repair. Although offshore wind power structures are not as prevalent in Australia, the lessons learnt are directly applicable to all structures: durability cannot be achieved when it is an afterthought.

Professor Robert Melchers (University of Newcastle) sparked a vigorous conversation with his paper about the 'Long-Term Survival of Reinforced Concrete Structures in Marine Environments' (co-authored with Igor Chaves, also University of Newcastle). This paper represented a considerable departure from the literature, proposing that the role of chlorides in the corrosion of steel in concrete was limited to facilitating the reduction in alkalinity of the concrete

Queens College Belfast, the site of Concrete Solutions 2014

Calcium Aluminate clinker on site at Kerneos, West Thurrock

On site with CPT in the UK



On site with CPT in the UK; supervision of cathodic protection system installation

matrix, and that intimate physical and chemical contact between the steel reinforcement and the high alkalinity of the cement paste (as achieved in good quality concrete through good quality mix design and best practice construction methods, including sufficient compaction) is the driving factor limiting corrosion initiation. This paper has definitely inspired some further reading!

Of course nothing brings a collection of international engineers, scientists and technologists together like the appearance of a common enemy, and the amused discussions which followed the discovery of corroding reinforcement and spalling concrete both around and within the lecture theatre which had been designated to host the 'Corrosion of Steel in Concrete' stream was the perfect icebreaker!

With the conferences completed, I headed north, to my next stop, Norway, where I visited the head offices of **Jotun** in Sandefjord, 120 kms south of Oslo. Jotun was established in Sandefjord in 1926, and with nearly 9,000 employees is now one of the ten largest paint companies globally. At Jotun I was hosted by Martin Isben, the Director for Technical Sales Support of Marine & Protective Coatings, and his colleague Tor Assrum, who provided a tour of their in-house testing and corrosion laboratory in Sandefjord. The fully equipped laboratory was conducting a thorough suite of both short and long term corrosion test experiments for potential new products and formulations. The laboratory included in house blast and spraying capabilities, and various testing environmental simulation equipment including fog boxes, splash/spray testers and environmental cyclers. Following the tour I was fortunate enough to meet with some of Jotun's research and development team to discuss potentially difficult applications we face in Australia.

My time at Jotun was punctuated with the opportunity to learn about various aspects of their business and their products. There was great focus on selecting the right product for the job, and perhaps even greater focus on getting the surface preparation and the application right.

From Norway I travelled to Copenhagen Denmark where I spent two days with Oskar Klinghoffer and Brian Kofoed at **Force Technology.** Force Technology is a large Danish company that services a range of market sectors through the development, and application, of technology. The Concrete Monitoring Department of Force both provides consulting services and manufactures corrosion related test equipment, anodes, reference electrodes etc. The visit included a tour of their workshop, demonstration and training in the use of their CorroMap corrosion monitoring equipment, and an overview of their corrosion rate monitoring probes, the CorroWatch and CorroRisk.

It was time to head back to the UK, and my first destination was **International Paint** in Felling, Newcastle-on-Tyne. International is the leading brand of AkzoNobel's Marine & Protective Coatings business unit with a history that stretches back to 1881 and currently has operations in 60 countries worldwide and more than 5,500 employees. I met with Michael Harrison, Market Manager for Linings, and Ian Fletcher, Senior Market Manager Protecting Coatings, who generously gave me their time to provide an overview of their company, and their products.

The highlight of the visit was a tour of the Intumescent Fire Protection Coating Laboratory on site. This large scale laboratory was the home of International Paint's research and development into fire protection. With full scale furnaces, complemented by onsite blasting and spraying facilities, the products and formulations were tested around the clock. The detailed chemistry in these high tech products was truly fascinating and it is worth your time to take a look at the video of these products in action on their website.

From Newcastle I headed towards London via the **University of Manchester** and the **University of Birmingham**.

The Manchester University Corrosion and Protection Centre is part of the Faculty of Engineering and Physical Sciences and is one of the world's

largest academic center's, focused on corrosion and its control. I met with George Thompson, Professor of Corrosion Science and Engineering, and members of his research group, including Dr. Surajkumar Pawar to discuss their current research into the corrosion mechanisms of aluminium and magnesium. We were also joined by Professor Geoff Scamans from Brunel University.

At Birmingham University, I met with Professor Alison Davenport of the School of Metallurgy and Materials and her research group, who gave overview presentations of their work including some truly fascinating studies using synchrotron imaging of corrosion mechanisms, including work on stainless steel pit formation.

In London, I had arranged a meeting with Tony Newton, the Director of Building Chemistry of Kerneos. Kerneos is a specialty cement manufacturer, supplying calcium aluminate cements, since 1908 (calcium aluminate cements were the focus of the paper I had presented in Belfast). I was invited to tour the cement plant at West Thurrock, in what was one of the highlights of the trip. The plant is situated on the Thames approximately 20 km east of London from where it can receive direct deliveries of the raw materials required. The plant manufactures calcium aluminate cements from raw materials and it was truly awesome to see the furnaces at work close up. The tour of the plant covered all aspects from delivery of the raw materials, the rotary kiln and control room, to the onsite packaging process.

Although my trip was drawing to an end, I still had time for a few more short visits. Paul Bravery of Fosroc hosted me at their London office and it was a great opportunity to consider some of the construction materials which were being developed and used in the UK and Europe, as well as highlight challenges we face in the Australian marketplace.

A meeting with Trevor Osborne doubled as an opportunity to learn about his company, **Deepwater Corrosion Services**, and a chance to meet with the **Institute of Corrosion, UK**. Trevor is the current President of the Institute of Corrosion, the UK counterpart to the ACA. Along with Sarah Vasey, the current Vice President, we discussed the ACA's Young Corrosion Group and how it compares with the Young ICorr as well as the potential for running ACA/ICorr joint training programs and certification schemes.

It is still difficult to fully comprehend the benefits of the scholarship. I learnt so much at the conferences, but I have hours of bedtime reading ahead with the conference proceedings. I met so many interesting and inspiring people that it was hard to keep track of everyone, but the true value of those contacts won't be realised for years to come. The opportunity to meet first hand with strong, successful, professional companies and world class research institutions, tour world class facilities and see how 'corrosion; is managed on the other side of the globe is a learning opportunity that will serve me well as I continue to service the corrosion and durability industries in Australia. Perhaps most importantly, personally, my exposure to such a diverse range of people, roles, industries and technologies, combined with some time away from the daily grind gave me the chance to reconsider my perspective on the industry, where I fit and how I'd like to grow with it.

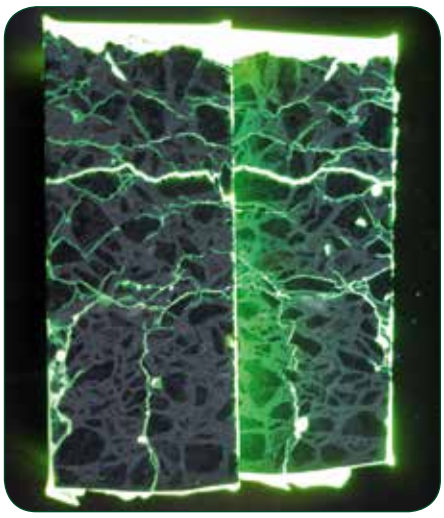
"It is still difficult to fully comprehend the benefits of the scholarship."
Dean Ferguson,
Infracorr Consulting

I'd like to take this opportunity to thank Infracorr Consulting for supporting me throughout this opportunity, as well as all the people who helped make the trip possible through helping organise introductions, meetings, tours, visits etc. Chris Weale, Peter Dove, Andrew Martin, Dean Wall, Andrew Dickinson, Nick Birbilis, Jessica Lyndon, Ian Godson and Luke Thompson all helped with introductions along the way, and I am sure there were others I may have forgotten. I'd like to thank all the people who took time out of their schedules to make me welcome throughout my trip. I've mentioned some of you here, but many names have not made it. I hope I can repay your hospitality in the future.

Finally, I'd like to thank the ACA Foundation for this once in a lifetime opportunity. I am humbled that you selected my application and hope we can look back and say the scholarships aims were met.

Environmental Chamber Testing at Jotun, Sandefjord, Norway

Corrosion monitoring equipment demonstration at Force Technology, Denmark



Concrete crack repair using an epoxy repair material, visible under UV light, Force Technology Denmark

ICC, South Korea

Matthew Dafter

Matthew Dafter recently attended the International Corrosion Congress in South Korea as the recipient of the International Conference Scholarship

I was fortunate enough to be awarded the ACA Foundation's International Conference Scholarship at the 2013 ACA Conference in Melbourne. The scholarship enabled me to attend the 19th International Corrosion Congress (ICC) in Jeju, South Korea, which was held in November 2014.

Attendance at the ICC was a great opportunity for me to present the results of my PhD research on the prediction of underground corrosion of cast iron water pipes, and to gain experience presenting at an international forum. I presented my paper on the first morning and was happy to get some good probing questions! The conference also provided a great opportunity to learn of recent developments in the field, particularly research coming out of Korea and China, where the majority of delegates were from. I attended some very interesting papers and plenary sessions; highlights for me included papers on atmospheric corrosion of marine sites in Saudi Arabia, work on corrosion rate measurement of food grade stainless steel in acidic foods and an excellent discussion on the concept of a corrosion passport for engineers.

The social program was well attended and thoroughly enjoyable and one of the real highlights for me was the cultural diversity among those in attendance. The conference dinner was thoroughly enjoyable. Listening to ABBA played on traditional Korean violins was certainly something different. I must admit I did wonder how I was going to get home when the schedule listed the last bus as leaving the venue at 8:20pm. However I needn't have worried. The conference dinner finished at 8pm sharp, which compared to the conference dinners I am used too, was certainly a surprise! The conference also featured some truly authentic Korean experiences, including a daily menu that prominently featured the Korean staples of raw fish and fermented cabbage!

As a corrosionist, it was nice to stay at a hotel that was having some corrosion issues too! There was a lovely steel reinforced handrail covered in decorative concrete that was showing some serious corrosion issues some 20 metres away from the ocean (see photo). There were also some lampposts that featured some fantastic corrosion. That is, of course, if you could look past the 5000 microns of paint that someone had slapped onto the post to hide the poor condition.

I would like to sincerely thank the ACA Foundation for awarding me the travel scholarship and providing me with the opportunity to attend the ICC. I would particularly like to thank Jacquie Martin for her assistance with the scholarship arrangements. It was a wonderful opportunity that I very much appreciated.

Now I'm off to have some fish (cooked this time of course) and fermented cabbage. Actually, on second thought, skip the cabbage!

Decorative concrete fence undergoing significant corrosion at seaside resort

Corroded lamp post at seaside resort

Location of seaside resort

International Travel Scholarship

Mike Rutherford

Mike Rutherford also received the international travel scholarship which enabled him to attend the Inaugural NACE European Corrosion Conference-Expo 2014, San Lorenzo de El Escorial, Spain. As well as participating in site visits and project meetings throughout Europe including receiving a briefing in regards to the corrosion prevention system adopted for the Confinement Shelter for the Chernobyl Sarcophagus, Ajaccio Deck on Corsica Island and Viaduc de Sylans, Lake Sylans.

More information and images from these meetings, site visits and projects will follow in the next edition of Corrosion & Materials.

2014 Scholarship Program

In 2014 the Foundation had the privilege of awarding the following scholarships, please join with us in congratulating the following recipients:

2014 Post Graduate ACA Conference Attendance Scholarship
The purpose of the Post Graduate ACA Conference Attendance Scholarship is to support a post graduate student to attend Corrosion and Prevention 2014 in Darwin.

- Soroor Chaziof, University of Auckland
- Jason Yu, Ian Wark Institute, University of SA

Soroor Chaziof Post Graduate Conference Attendant wrote that '*the conference was a great opportunity to attend the presentations on various interesting topics to get a better understanding of the challenges that industry is facing and the available solutions and research activities to address those issues. The conference also provided a fantastic networking opportunity with individual experts, researchers and leading companies in various fields of corrosion and prevention from New Zealand and Australia.*' While another Post Graduate ACA Conference Attendance Scholarship recipient **Jason Yu** from the University of SA reported that, '*as a PhD student from a science background, I found that the conference not only gave me new ideas, such as glass flake fillers in a tidal gate coating, but also opened up my horizon into other areas… At the gala dinner, I got in touch with an industrial contact who expressed interest in the research I am currently doing.*'

2014 First Timers ACA Conference Attendance Scholarship
The purpose of the First Timers ACA Conference Attendance Scholarship is to support an individual who has never attended Corrosion & Prevention before to attend and participate in Corrosion and Prevention 2014 in Darwin.

- Philip Schmidli, Woodside Energy
- Ashleigh Trainor, Santos
- Hannah Watchman, Dept SA Planning & Infrastructure

Ashleigh Trainor from Santos indicated that, '*the conference was a great experience, and I believe it is an invaluable opportunity for all young corrosion professionals to attend*'. **Hannah Watchman** from the SA Department of Planning & Infrastructure reported, *'I am pleased to say I made some new friends and I feel like I made the most of this opportunity.'* While **Philip Schmidli** from Woodside Energy indicated that his, *'personal highlights of the conference were the P F Thompson Memorial Lecture delivered by Warren Green and the ACA Annual Dinner and Awards. I would recommend anybody who has not attend an ACA conference to make an effort to do so in the future. '*

2014 Future Leaders Forum

The purpose of the Future Leaders Forum is to assist younger members of the industries that ACA serves, to develop skills which will assist in their personal and professional development. The ACA Foundation would like to congratulate the following 2014 Future Leaders Forum recipients:

- Ain Beruldsen, Savcor
- Rochelle Bosworth, GHD
- Darren Cram, ATTAR
- Stephen Finger, ALS Industrial
- Daniel Frost, Jotun
- Marius Gray, Vector Ltd
- Vijay Hillier, Santos
- Bradley Knott, McElligotts Tas
- Tim Lim, WGIM
- Simon Little, Southern Prospect
- Josh Logan, Anode Engineering
- Jason Maiolo, Santos
- Jordan May, Quality Maritime Surveyors
- Priya Pandarinathan, Curtin University
- Simon Poggioli, Extrin
- Phil Schmidli, Woodside Energy
- Brad Slocum, Select Solutions SP Ausnet
- Terence Tjandra, Savcor
- Will Von Moger, Savcor
- Hannah Watchman, Dept of Planning, Transport & Infrastructure

One of the Future Leaders Forum participants indicated that the Forum was a, '*Brilliantly run event with some great key speakers. There are not many possibilities for young people in the industry to network with similarly aged people, so events like this and other YCG events are great!*'

The Future Leaders Forum will continue in 2016.

Centurion Donor Program

The Foundation Centurion Donor Program was launched in April 2013 and has received broad support from individuals within the Australasian Corrosion Community.

An ACA Foundation Centurion is an individual or company that commits themselves to a contribution of at least AUD$100 annually for as long as they are able. 100% of the donation is applied for the benefit of scholarship, bursary and prize recipients, and the donation is tax deductible.

The Centurion program was developed as a way of growing and diversifying the Foundation's reserves further in order to continue to offer extensive scholarship and bursary programs.

Our first Foundation Centurion Donor is David Nicholas from Newcastle. In committing to the Foundation Centurion program, David said:

"It's a pleasure to be an ACA Foundation Centurion as I have received so much assistance and encouragement from the ACA community throughout my career. It's a privilege to be able to support the association that has supported me and to contribute to the education of future generations of corrosionists."

If you would like more information on becoming an ACA Foundation Centurion Donor, please contact Jacquie Martin on foundation@corrosion.com.au or phone +61 (0)3 9890 4833.

David Nicholas receiving his Centurion certificate.

ACA Foundation 2015 Scholarship Program Release

After the outstanding success of the ACA Foundation Scholarship Program in 2013 and 2014; the ACA Foundation is delighted to release the following scholarships in 2015.

- **1 x Brian Cherry International Travel Scholarship, valued at $8,500**
- **1 x International Conference Scholarship, valued at $3,500**
- **5 x ACA Corrosion Training Course Registration Scholarships, valued at $2,000 each**
- **1 x Post Graduate Conference Attendance Scholarship, valued at $1,345**
- **4 x First Time Conference Attendance Scholarships, valued at $2,000 each**

For more information on the ACA Foundation Ltd 2015 Scholarship Program including criteria, deadlines and application process please refer to the Foundation page on the ACA website www.corrosion.com.au or contact Jacquie Martin on +61 (0)3 9890 4833

"It's reassuring to know that other people my age share my pride and passion for their work in the industry and are eager to go out of their way to increase their understanding."
Hannah Watchman, SA Dept of Planning & Infrastructure

Advancing corrosion mitigation through education

Donor List

The ACA Foundation Ltd. would like to acknowledge and thank the following donors for their generosity and support of the work of the Foundation. *List accurate as at 15 January 2015.*

Platinum

The ACA Inc.
ACA Queensland
ACA South Australia
ACA Victoria
ACA Western Australia
Savcor Products
Tinker & Rasor (Mark J Byerley Sr)
Wayne A Burns

Gold

ACA New South Wales
ACA New Zealand
Corpro Australia

Silver

ACA Newcastle
ACA Tasmania
AMAC Corrosion
Denso Australia
Galvanizers Association of Australia
International Protective Coatings
Peerless Industrial Systems

Bronze

Alocit Australasia
Ameron Coatings
Apollo CMS
Australian Electrolysis Committee
Australian Foundry Institute
Barrie Toomath
Blastmaster
Brian A Martin
Building Research
Carboline Australia
Cathodic Diecasting QLD
Coatings & Linings NZ
Connell Wagner
Corrotec Services Pty Ltd
Corrotek Consultants
Dulux Protective Coatings
Extrin Consultants
Frank L Burns
GMA Garnet Group
Graham Robilliard
Hempel(Australia)
Hunter Water Australia
Hydro-Chem
Incospec & Associates Australia
Jotun Australia
M Brodribb
NACE International
NMT Electrodes (Australia)
Nordarcon
Petro Coating Systems
Robert J Freedman
SA Electrolysis Committee
Solomon Corrosion Control Services
South Coast Surface Protection
Total Corrosion Control
United Water International
Valicote
Willie L Mandeno

Copper

A & A Szokolik
Altex Coatings
Andrew Peek
Anonymous Donor
Anthony A Betts
Australian Pickling & Passivation Service
Brian T Hickinbottom
Cindy Lee
Clifford Parkes
Craig Hayden
CSIRO Manufacturing Science & Technology
David Nicholas
Dean Wall
Donald J Bartlett
Fred Salome
Gary Evans
Geoff A Robb
Geoffrey R Cope
George A King
GPR Electrical (WA)
Grahame Vile
Gregory C Moore
H David Blackburn
Harry Lee
Helena Alexander
Independent Coatings Consultancy
John Furstenberg
John L Bristow
Kerry Dalzell
Marty Dunford
Maurice Linker
Metal Spray Suppliers (NZ)
Michael Olley
Norm Beckwith
Peter Crampton
Philip Maastricht
Pierre Crevolin
Pumpline
Quilter Consulting
Rafael Pelli
Robert Callant
Robert Cox
Rodney Wubben
Roger Franklin
Roman Dankiw
Rust Bullet Australia
Rust-Oleum Australia
Sally A Nugent
Steve Poncio
Timothy Blair
Vic McLean
Warren K Green

Other

Bechtel International Inc
International Corrosion Services
John Little
Les H Boulton
Luechai Silakarn
Michael Kelett

Centurion

Alex Shepherd
Alexander (Sandy) McPherson
Allan Sterling
Allison Selmen
Andrew Hargrave
Andrew Peek
Andrew Weatherburn
Barrie Toomath
Brad Dockrill
Brian Kinsella
Brian Martin
Bruce Hinton
Craig O'Brien
David Hopkins
David Nicholas
David Towns
Dean Wall
Fikry Barouky
Geoffrey White
Graeme Kelly
Graham Robert Carlisle
Graham Sussex
Grahame Vile
Hannah Watchman
Harvey David Blackburn
Ian Godson
Ian MacLeod
Jim Galanos
John Bristow
John Grapiglia
Justin Rigby
Kingsley Brown
Les Boulton
Luke Emery
Luke Menefy
Mark Davidson
Matthew Dafter
Mike Rutherford
Nick Birbilis
Paul Van Gameren
Peter Dove
Philip Jack
Philip Schmidli
Richard Brodribb
Ricky Bannon
Robert Butcher
Robert J Freedman
Robert Jeffrey
Roman Dankiw
Tony Smith
Vincent Stafrace
Warren Green
Wayne Burns
Willie Mandeno

ACA Foundation Ltd. Board of Directors & Office Holders

Dean Wall	*Chairman*
Kingsley Brown	*Director*
Roman Dankiw	*Director*
Sarah Furman	*Director*
Ian Godson	*Director*
Warren Green	*Director*
Dr Ian MacLeod	*Director & Chairman, ACA Foundation Ltd. Scholarship Fund*
Jacquie Martin	*Secretary & Deputy Chair*

Contact Us:

ACA Foundation Ltd.
PO Box 112
Kerrimuir VIC 3129

Phone: +61 (0)3 9890 4833
Fax: +61 (0)3 9890 7866
Email: foundation@corrosion.com.au
Internet: www.corrosion.com.au
ABN: 98 141 979 937

Advancing corrosion mitigation through education

Corrosion Resistance of Alternative Stainless Steels

For many years, high quality, long service and durability have been associated with austenitic stainless steels such as 304 and 316 grades that account for more than 60% of the Australasian market. Popularity of these steels is due to a combination of good fabrication properties, reasonable level of corrosion resistance and satisfactory experience in many different applications.

Fluctuations in the nickel prices have led to an increased use of low-nickel alternatives that can be found among ferritic stainless steels, which essentially contains no nickel, or austenitic stainless steels in which part of the nickel content has been replaced by nitrogen stabilized in manganese, or lean duplex stainless steels with reduced nickel and/or molybdenum content. However, there has been little experience to date with application of these steel grades.

The majority of New Zealand stainless steel applications are located along the coastal line and therefore exposed to the marine environment. In this case, the grade selection is often governed by the need to prevent surface discoloration and corrosion from the sea salt spray.

The NZ Heavy Engineering Research Association (HERA) in cooperation with NZ Stainless Steel Development Association (NZSSDA) and international partners University of Applied Sciences, Konstanz and BAM Bundesanstalt für Materialforschung und -prüfung Berlin, Germany have carried out comparative investigations where in each case one or several representatives of a material group were taken into account. The material groups covered were: lean duplex stainless steels (2101, 2202 and 2304), manganese alloyed austenitic (J4, H400) and ferritic stainless steels (444, 445M2, 404GP, 441, and 3Cr12). Reference grades were 316 and 304.

Their corrosion resistance to a coastal atmosphere was tested at Muriwai Beach, New Zealand and Helgoland Island in Germany. The same materials were tested over a period of 24 months. Specimens were taken from cold rolled and solution annealed plates with a thickness range from 1 to 2 mm. The investigations were performed with specially worked surface conditions. The surface preparation included different methods like grinding, polishing, welding and shot-peening. Figure 1 shows the atmospheric exposure test rack with coupons at Muriwai Beach near Auckland.

All materials showed some corrosion effects on the surface and the influence of the different surface conditions could be observed. Figure 2 shows an example of the kind of corrosion attack after two years exposure near a surf beach. Besides the visual differences of the coupons there are differences in the depth of the pits.

For evaluating the corrosion attack at the surface, visual observation and an image analyzing method according to ISO 10289 was used.

It can be observed that there are some differences in the corrosion resistance depending on the test site, alloy composition and surface condition. It can be clearly observed, that some of the stainless steels tested offer at least the same resistance as compared to grade 316.

Good resistance was observed in Lean Duplex Stainless steels 2101 and 2304 and the molybdenum alloyed Ferritic Stainless Steels 444 and 445M2. These materials offer attractive corrosion properties compared to that of grade 316. However, when using ferritic materials the mechanical behaviour and weldability aspects must also be taken into account.

Detailed results of the corrosion tests have been published in the papers referenced below. A copy of the *Stainless Steel World* article can be obtained from HERA Library, email: info@hera.org.nz

By **Michail Karpenko**,
Manager NZ Welding Centre, HERA
Email: welding@hera.org.nz

References:

i. Michail Karpenko, Paul Gümpel: Welding aspects and corrosion performance of new ferritic and manganese bearing stainless steels in the coastal environment. 18th International Corrosion Congress, Perth 2011.

ii. Paul Gümpel, Florian Leu, Andreas Burkert, Jens Lehmann and Michail Karpenko: Corrosion resistance of lean alloy alternatives for 300 series stainless steels – Part 1. Stainless Steel World, June 2014.

iii. Paul Gümpel, Florian Leu, Andreas Burkert, Jens Lehmann and Michail Karpenko: Corrosion resistance of lean alloy alternatives for 300 series stainless steels – Part 2. Stainless Steel World, July/August 2014.

Figure 1: Rack with coupons on Muriwai Beach/New Zealand.

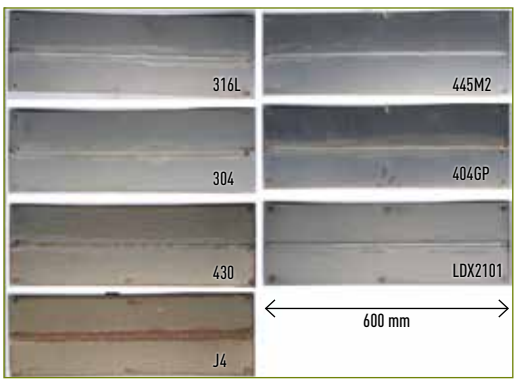


Figure 2: Examples of the surface appearance of some of the welded test coupons after 2 years exposure.

Coatings Inspection Certificate

Up until 2005 The Australasian Corrosion Association Inc conducted a 5 day Coatings Inspection Certificate Course. It was designed to provide the requisite skills and knowledge to inspect protective coatings following the requirements of Australian/New Zealand Standards.

The list below contains the names of qualified ACA Coatings Inspectors who have satisfied the requirements to be issued with an ACA Coatings Inspection Certificate and who have 'refreshed' their certificate within the 5 year time frame required by the ACA Council. Some inspectors have cross – accredited to the internationally recognised NACE Coatings Inspection Program. In those cases, the validity of their ACA certification has been reconfirmed.

Every care has been take to ensure that at the time of publishing the information is correct. The Australasian Corrosion Association Inc does not accept any responsibility for any consequences which may arise from the use of this information. Those wanting to engage a Coatings Inspector should rely on their own judgement and if necessary seek other advice as to whether the person has suitable work experience and references for the type of work proposed.

No legal liability for negligence or otherwise can be accepted by The Australasian Corrosion Association Inc for the information or the use of the information contained in this listing.

If you have any queries please contact The Australasian Corrosion Association Incorporated directly on +61(0)3 9890-4833 or via email to aca@corrosion.com.au.

Please note: this list is current as at 16 January 2015.

ACA Coating Inspectors		
Name	**Cert. No.**	**Expiry Date**
Richard Adams	1230	19/04/2015
Kamran Armin	4232	28/02/2016
Peter Atkinson	3234	31/07/2015
Trevor Baensch	2211	12/08/2015
Travis Baensch	4209	12/08/2015
Stuart Bayliss	247	31/12/2018
Ben Biddle	1279	28/02/2015
Mark Blacklock	3501	2/07/2015
Michael Boardman	1051	31/12/2017
Jason Bourke	2597	31/12/2019
Matthew Boyle	1429	30/04/2016
Kingsley Brown	2603	31/10/2015
Sean Anthony Burke	3428	31/12/2018
Harold Burkett	361	28/02/2017
Elliot Burns	972	19/04/2015
Micah Butt	2397	31/10/2016
Luis Carro	2212	31/12/2017
Rod Cockle	1410	30/11/2015
John Cooke	3235	31/12/2018
Cameron Cooper	466	6/07/2016
Dean Crase	4137	6/07/2016
Michael Crowley	4197	31/12/2017
David Daly	7343	31/12/2016
Cheryl Dalzell	3940	19/04/2015
Robert de Graaf	719	31/12/2017
Phill Dravitski	1593	31/03/2015
William Dunn	3386	31/12/2018
Ken Dunn	1296	6/07/2016
Dave Elder	155	30/11/2015
Todd Elkin	3402	19/04/2015
John Elomar	4204	19/04/2015
Tony Emery	4130	2/07/2015
Tony Evans	2086	6/07/2016
Wayne Ferguson	893	31/12/2017
Phillip Foster	2254	31/12/2019
Rob Francis	720	31/12/2017
Robert Freedman	76	31/12/2017
Brett Gale	3774	12/08/2015
David Gates	2599	19/04/2015
Collin Gear	2623	31/12/2017
Robert Glover	1362	31/12/2017
Ian Glover	393	28/02/2015
Wayne Gray	3606	31/12/2019
Ray Grose	2956	31/12/2017
Jim Haig	394	12/08/2015
Brian Harris	1054	31/12/2018
Peter Hart	1	31/10/2015
Shane Hawker	7342	31/12/2016
Rohan Healy	3184	31/12/2017

Clayton Henry	1595	31/12/2017
Chris Heron	1619	31/05/2016
Don Herrigan	4033	12/08/2015
Anthony Heuthorst	2297	31/12/2019
Frank Hiron	2888	31/12/2018
Paul Hunter	2988	31/12/2017
Jeffrey Hurst	1746	31/12/2018
Gary Hussey	3984	2/07/2015
Clinton Iliffe	4034	12/08/2015
Robert Johnson	2625	31/12/2018
Matthew Johnson	2359	12/08/2015
Robert Johnson	3354	12/08/2015
Michael Johnstone	2964	31/12/2018
Roger Kearney	1121	31/12/2018
Graeme Kelly	721	31/12/2017
Leonard Kong	3538	31/12/2018
Narend Lal	3355	31/12/2019
Alan Lee	3539	31/12/2018
David Lepelaar	3356	31/12/2018
Neil Alan Lewis	2598	31/12/2018
Daniel Lillas	3597	30/11/2019
Peter Luke	3795	31/12/2019
Jonathan Mace	4035	6/07/2016
Alistair MacKenzie	4191	31/12/2017
Spencer Macsween	3170	31/12/2017
Willie Mandeno	1216	31/12/2017
Tony Mans	3233	31/12/2017
Bradley Marsh	3232	30/11/2015
Andrew Martin	545	31/12/2019
George Martin	669	2/07/2015
Garry Matthias	1481	30/04/2016
Peter McCormack	4353	31/12/2017
David McCormack	4352	6/07/2016
Brett Meredith	2218	30/11/2015
John Mitchell	1042	31/12/2017
Wayne Mitchell	3357	2/07/2015
Vic Monarca	2053	6/07/2016
Wessel Mulder	7351	31/12/2017
Peter Nicholson	4086	12/08/2015
Stephen Nixon	2256	31/12/2017
Eric Norman	7430	31/12/2016
Dennis O'Loughlin	7353	31/12/2017
Gerald Owen	7341	31/12/2016
Clifford Parkes	3607	2/07/2015
Mervyn Perry	268	31/12/2017
Lorraine Pidgeon	1513	31/12/2017
Graham Porten	2257	31/12/2019
David Power	2487	19/04/2015
Daniel Price	4129	30/06/2016
John Puljak	3780	12/08/2015
Barry Punter	1843	31/10/2015
Greg Reece	3508	19/04/2015
Tony Ridgers	421	30/11/2015
Rick Roberts	1316	28/02/2016
Dean Rowe	4200	2/07/2015
Valentine Scriha	1896	12/08/2015
Kevin Sellars	7352	31/12/2017
Kevin Sharman	627	30/11/2015
Tracey Sherman	1829	31/12/2018
Douglas Shipley	2221	2/07/2015
Michael Sillis	844	31/12/2017
Gary Smith	2512	31/12/2019
Trevor Smith	1035	31/12/2017
Laurence Snook	1526	31/12/2017
Dragan Stevanovic	2960	31/12/2018
Neil Stewart	1358	31/12/2017
Steven Stock	3923	6/07/2016
Steve Storey	3176	29/02/2016
Raymond Street	3173	31/05/2016
Peter Sutton	3183	31/12/2017
Dennis Tremain	1036	31/12/2017
Andy Vesco	3783	19/04/2015
Paul Vince	7355	31/12/2017
Charles Vincent	1827	31/03/2016
Mark Weston	883	31/12/2017
Charles Wheeler	3943	19/04/2015
Shane White	2869	31/08/2016
Craig Williams	4176	12/08/2015

Protective Coatings Preventing Corrosion

How, Why & When to Act

20 November 2014

Brisbane

SPONSORED BY:

galvanizers ASSOCIATION OF AUSTRALIA

International

MEDIA PARTNER:

WorldOils

PROUDLY PRESENTED BY:

Australasian Corrosion Association Inc.

The Protective Coatings Technical Group of the ACA held a technical event on Thursday 20 November at the Novotel Hotel in Brisbane.

This full day technical event had over 60 delegates from a broad cross section of the industry from around Australia & New Zealand in attendance. The audience heard a range of presentations including, protective coatings research, case study reviews, technology updates and a guide on project delivery. Following the presentations was a robust forum which had a high level of delegate engagement followed by a networking function at the conclusion of the event. Below is a summary of the day's presentations.

A survey was sent to ascertain the success of the event, with 95% of respondents stating the event was very good or excellent and met their expectations in terms of technical content and experience on the day.

The ACA would like to thank all speakers, sponsors and delegates who attended this event and for making the day a huge success!

Long Term Protection of Marine Piling – Are We Stuck In Our Ways, Or Just Safely Stuck In The Waves

Steve Pritchard, International Paint

In most sectors of the protective coatings industry the products on offer are in a constant state of refinement, replacement or improvement, with systems, testing and specification constantly under review. However, in one of the most frequently encountered severe environments in the protective coatings industry, the preferred solution has remained largely unchanged for the last 15-20 years. This presentation demonstrated the reliability with which existing high build systems achieve long term protection of marine pilings, and other marine and coastal assets, and discussed the key elements for consideration as we seek to tinker with a proven solution. It explored current thinking and practice with respect to required system thicknesses, the need (or not) for glass flake re-enforcement, and an overview of relevant testing

and standards for consideration when evaluating both proven and newly promoted systems.

Protective Coatings - A Guide to Project Delivery

Justin Rigby, Remedy Asset Protection

When thinking of total project appraisal & delivery, many professionals and contractors don't recognize their place within an industry that has evolved throughout the 20th century. This paper aims to present a description of the industry and how the various intermediaries fit into the larger picture. By formalising the industry structure to describe how projects get delivered we can understand where an asset owner's project can fit into this industry structure.

Extending the Service Life of Existing Concrete Structures Utilising Crystalline Coatings

Farhad Nabavi, Xypex Australia

This presentation briefly explained how crystalline technology is introduced to an existing concrete matrix by coating and further present evidence of improvements in durability that are achieved by its ability to work positively toward controlling the main deterioration processes (eg, corrosion of steel, carbonation, chloride ingress etc), thereby reducing future maintenance costs and extending the service life of concrete structures.

Batman Bridge – Case Study

Ivan Berry, McElligotts (TAS) & Dean Wall, Jotun

This presentation covered the history of building and maintaining this iconic cable-stayed bridge, whose structure spans over 430 metres, with thousands of square metres of structural steel requiring a robust protective coatings system. Work is conducted from a motorised gantry structure that has been purpose built for the containment of abrasive blasting and protective coatings works. The Batman Bridge located to the north on the Tamar River is a major asset of the Department of State Growth (DSG) built between 1966 and 1968 has been a vital link between the West and East Tamar.

Maintaining and painting the structure over the last decade has evolved and all parties have built a strong working relationship and the Department of State Growth (DSG) is extremely proud of the asset preservation outcome achieved with the ongoing works program.

Design + Environment + Communication = Durability

Peter Golding, Galvanizers Association of Australia

This presentation provided attendees with real life examples of durability of hot dip galvanized articles focused on the design guidelines in the new AS/ NZS 2312.2.

Case studies were presented from the mining, construction and infrastructure sectors where similar environments have resulted in very different outcomes, depending on the level of communication with the key stakeholders. Other examples demonstrated how design influences the durability and quality of the galvanized article.

Finally, several duplex coating projects were used to illustrate the extension of protective life and potential benefits; while also highlighting some pitfalls for specifiers and applicators.

Near Field Communication – Utilising Everyday Technology to Map the Life of Assets

Lawrence Smith, Mattioli Bros

The success of future maintenance contracts will depend on the technology found today in the consumer market. Mattioli Bros shared their experiences to date in trialling the latest technology in asset tagging which can provide Contractors, Councils and Suppliers alike a cost effective approach to tagging assets for maintenance, specification or inspection purposes. Mattioli Bros presented the lessons learnt on a new wireless communication technology similar to WiFi or Bluetooth that has been modified to provide significant cost reductions in the tracking of maintenance and inspection activities.

Underground Pipeline Coatings / Past to Future

Francis Carrol, APA Group

Pipelines in Australia rely on coatings to protect the pipe wall from corrosion. Since pipelines transport hazardous fluids at high pressures, any failure could be catastrophic. Careful selection, application, monitoring and maintenance of coatings are vital to the safe operation of pipelines. This presentation gave an overview of the spectrum of pipeline coatings, their selection and use and some current developments and issues with pipeline coatings from a pipeline owner/ operator's perspective.

Coatings Experience with the use of High-Ratio Calcium Sulfonate Alkyd (HRCSA) - Case Studies

Willie Mandeno, Opus International Consultants

This presentation began with a discussion of the advantages and disadvantages of the high-ratio calcium sulfonate alkyd (HRCSA) coating system, developed and used in North America as a novel maintenance coating on bridges and above ground pipelines, and recently introduced to Australasia. Trial results published by FHWA and JPCL are reviewed and illustrated case studies of recent applications in Australia and NZ were presented.

Monitoring of Coatings Breakdowns - Research Perspective

Dr John Colwell, QUT

Corrosion of materials is a multi-billion dollar industrial problem, with methods to detect or prevent corrosion being necessary to mitigate its destructive effects. Painting is a major corrosion prevention method, but paints eventually break down leading to exposure of the underlying metal substrate to corrosive environmental elements. Methods were presented for detecting both the breakdown of protective paint coatings and the corrosive environment near exposed metal structures. An outline on the use of corrosion sensors for monitoring corrosion of civil and industrial assets was also presented.

For further information on the ACA Technical Groups or to provide suggestions & or comments for future events please contact Brendan Pejkovic in the ACA office on bpejkovic@corrosion.com.au

2015 Coatings Events

The Coatings Technical Group has planned two events for 2015. The first will be held in Adelaide on **19 March** and the second in Perth on **13 August**. More information about these events will be available shortly.

Trucoat Industrial Coating

Q: In what year was your company established?

A: Trucoat Industrial Coating was officially established in Feb 2010 and is a sister company of Manuele Engineers Pty Ltd. The business was initially created to support the fabrication growth of Manuele Engineers. In the past 3- 4 years we have expanded our customer base and we now offer our services and capabilities to a number of select third party client's. It is important to note that Trucoat Industrial Coating inherited the staff of a former local South Australian blast and paint business known as Troisi Steel. In fact the former owner and well known surface treatment expert, David Troisi, is our Paint Manager and he brings over 30 years experience in the field of industrial coatings.

Q: How many employees did you employ when you first started the business?

A: When we first opened and started painting we had 6 employees including the Paint Manager. As work flow improved we increased our staff numbers to support the additional capacity required.

Q: How many do you currently employ?

A: We currently employ 15 employees and this can fluctuate depending on the number of projects active, scale of production and whether capacity requires ramping up.

Q: Do you operate from a number of locations in Australia?

A: Our operation is based solely from North Plympton, South Australia. The Trucoat business adjoins Manuele Engineers Pty Ltd and boosts a modern facility situated on 45,800m² of land. The Trucoat facility is constructed in a manner which optimises the flow of product throughout the production cycle and features state of the art abrasive blasting capabilities utilising both automated and conventional systems – incl. CNC technology.

Q: What is your core business? (e.g. blasting and painting, rubber lining, waterjetting, laminating, insulation, flooring etc.)

A: Our core business consists of abrasive blasting, basic coating systems to the most complex multi-coat systems, intumescent fire rating, high gloss architectural finishes, confined space, immersion coatings, solventless epoxy coatings and UHB coatings.

Trucoat is dedicated to delivering the highest possible standard, on time and at competitive pricing with a focus on consistent and efficient communication. This dedication is backed by our top quality service, products, professional expertise and support.

Q: What markets do you cover with your products or services? e.g. oil & gas, marine, chemical process, general fabrication, tank lining, offshore etc.

A: Our market segment is much diversified ranging from light to heavy fabrication and engineering projects that involve structural steel and plate. We specialise in pressure vessels and we predominately service industries such as commercial construction, resource mining, oil & gas along with servicing independent contracts with ports, water, government departments and shipbuilding industry.

Q: Is the business yard based, site based or both?

A: The majority of our work is carried out within our facility so predominately we are yard based. However there are times where a small component of our work involves attending construction sites to carry out on-site touch-ups if required.

Q: What is your monthly capacity or tonnage that you can blast and prime?

A: Painting can be undertaken in more than 26 dedicated spray areas in our facility. We have a 3,200m^2 undercover blast and paint building plus additional 650m^2 specialised paint shop, therefore our capacity is quite large. In addition we have constructed a conventional blasting room measuring 28 meters in length x 6 meters clear height x 7 meters clear width under the roof of a separate building. We also have 20,000m^2 of external concrete hardstand storage area. Our capacity output largely leverages off the work-flow of Manuele Engineers; which can be in excess of 15,000 tonnes/annum.

Q: Do you offer any specialty services outside your core business? (eg. primary yard based but will do site touch up etc.)

A: Apart from our core business we provide: On site touch ups – multi coat systems - intumescent fire rating - transportation – technical support – storage – project management. We can also provide fabrication services due to our sister company (Manuele Engineers) being on the same premises.

Q: What is the most satisfying project that you have completed in the past two years and why?

A: There are many satisfying projects we have been fortunate enough to be involved with. However the most satisfying project we have recently completed is the Australian and International award winning $535m 'Adelaide Oval Southern Grand Stand Redevelopment Project'. This complex project involved individual components that were excessive in size ranging up to 42 tonne each and the finish was a high gloss polysiloxane. Some 2,000 tonne of painted steelwork remains exposed for the world to see. We are very proud of the quality of surface treatment finish we achieved on a very technically difficult project. The project was completed on schedule to the client's satisfaction and on time for the Ashes series.

Q: What positive advice can you pass on to the Coatings Group from that satisfying project or job?

A: Analyse your work flow and staff capabilities to provide the best possible efficiencies to your business and ultimately your customers. Invest in technology to improve transition from fabrication to surface treatment and ease of traceability. Understand the industry that your client lives in and ensure their expectations are met. From the outset of the project we set our own standards high…!!!

Q: Do you have an internal training scheme or do you outsource training for your employees?

A: Training of employees plays a very important part in our business and we generally utilise a lot of in-house and hands on training; along with specific training from outside service providers, as required.

Contact us:
Trucoat Industrial Coating
240-280 Morphett Road,
North Plympton, SA 5037

Phone: +61 (8) 8414 2080
Fax: +61 (8) 8414 2050
Mobile: +61 (0) 488 001 696

CORROSION RESEARCH at The University of Newcastle

Corrosion research at the University of Newcastle deals mainly with practical applications and is focused largely on the performance of physical infrastructure. This includes bridges, wharves and jetties, offshore structures, pipes, pipelines and liquid storage facilities and coastal and inland structures. Long-term satisfactory performance is important - to owners, to asset managers and to engineers and corrosion is of increasing interest.

Much corrosion research focuses on basic phenomena. However, models for expected corrosion loss or expected pit depth for use by engineers are not well developed. Major projects must meet regulatory or professional risk probabilistic risk criteria and these usually require predictions of long-term behaviour and impacts. Therefore the models we develop must be consistent with probability concepts and be as realistic as possible. This also requires a strong practical focus.

All the senior corrosion researchers at Newcastle have extensive experience in industry, both private industry and government agencies. They also maintain close links through consulting advice and expert opinion including legal advice, and through the ACA and other professional groups. They also have given many keynote talks to a variety of international and local audiences including corrosion researchers, microbiologists and structural and other engineers. As a result there is on-going interaction between practical needs and requirements and our applied and fundamental research work.

The early corrosion research at Newcastle dealt mainly with the corrosion of commercial ships and navy vessels and also with steel marine immersion corrosion. The current research portfolio is much broader. This is evident by the many papers contributed to the ACA and other conferences and to international journals. The following gives a brief summary.

- Corrosion of steels in marine environments, including quantifying the effects of MIC and seawater pollution on corrosion and the effect on ALWC (accelerated low water corrosion) and on the corrosion of chains used for mooring FPSOs (Floating Production Storage and Offloading vessels) (Robert Jeffrey and Rob Melchers)
- Long-term corrosion of steel in marine and inland atmospheric exposures, including the possible influence of microbiological effects (Robert Jeffrey)
- Long-term pitting corrosion of steels and cast iron and the pitting corrosion of weld zones in pressure pipelines (Igor Chaves)
- Rate of corrosion and pitting in the tidal zone of cast iron bridge piers around 100 years old for remaining life prediction (Rob Melchers)
- Long-term behaviour of actual reinforced concrete structures and the corrosion of steel reinforcement in marine and other environments (Torill Pape[a], Igor Chaves and Rob Melchers)
- The progression of the corrosion of the interior walls of large diameter concrete sewers and extrapolation to long-term sewer deterioration (Tony Wells)
- Long-term trends and the factors influencing the long-term corrosion of the exterior surfaces of buried cast iron and steel water pipes (Robert Petersen)
- Effectiveness of Linear Polarization Resistance (LPR) as a technique to help predict the likely long-term corrosion of buried cast iron water pipes (Matt Dafter and Tony Wells)
- Mathematical-statistical analysis of the long-term development of pit depth and pit size in older cast iron pipes (Zohreh Soltani and Rob Melchers)

Example of ALWC with ground water running back into Newcastle harbour at very low tide.

Example of severe pitting corrosion of full-size (76mm diam) steel mooring chain.

16 mm diam. chain after 6 months corrosion and 125,000 cycles of wear.

- Numerical study of the location of initiation and the subsequent development of tensile and fatigue cracks starting from pits in steel and cast iron pipes under pressure load conditions (Ali Rajabipour and Rob Melchers)

- Properties and grain structure effects on the corrosion of old cast iron pipe materials (David Nicholas[b])

- Wear and corrosion of scale model mooring chains and also the wear of full-size FPSO mooring chains (Amin Lotfollahi Yaghin and Rob Melchers)

- Interior corrosion of oil industry water injection pipelines and simulated under-deposit corrosion laboratory studies at elevated temperatures (Xiang Wang, Iulian Comanescu[c] (Swerea-KIMAB) and Rob Melchers)

Some preliminary studies have been conducted also on the long-term corrosion and pitting of aluminium and copper alloys in a variety of marine and other environments. These tend to show interesting parallels with the long-term corrosion of ferrous metals.

Many of the above projects have a strong emphasis on the use of real-world experimental data. Laboratory studies also are used, always under conditions that closely replicate real environments. This is particularly important for investigating microbiological corrosion (MIC). It is almost impossible to replicate under laboratory conditions and to study by electrochemical techniques. The main field site for research and testing is at Taylors Beach at NSW Fisheries. It also has a facility for sterilizing seawater and for nutrient dosing for the study of microbiological activity. This facility also is used cooperatively with others, for example researchers from Curtin University and Swinburne University. Other field sites are the Hunter River (Port Corporation), Belmont Beach (Hunter Water), Port Arthur (Historic Management Authority) in Tasmania, Port Darwin, as well as sites owned by water utilities in Sydney, Melbourne, Perth, and the Hunter region. As expected there is ready access to the standard tools such SEM/EDS, XRD, Raman, optical microscopy and a range of other equipment and chemical analyses tools, including for microbiological testing. There also are links for microbiological testing with the University of Oklahoma (USA) and with Curtin University.

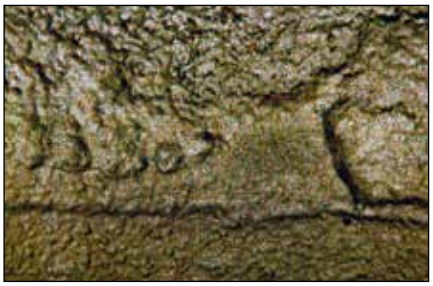
About half the corrosion research funding at Newcastle comes from the Australian Research Council mainly as Discovery grants and high-level personal research grants. There is also considerable support from private industry, including from the consortia set up by Australia's major water utilities, led by Sydney Water with funding also from the UK and the USA, funding from AMOG Consulting, Melbourne and Houston acting as the project manager for Joint Industry Projects through international organizations such as the FPSO Research Forum and 'Deepstar' and in turn funded by many international oil companies (the so-called 'majors'), by classification societies and by offshore operators and suppliers. Research funding also has come from international research bodies such as the EEC-Marie Curie program.

The Newcastle research group includes 3 ACA Corrosion medallists (Jeffrey, Melchers, Nicholas) and has won awards for corrosion research from the ACA as well as from the Institute of Corrosion (UK), The Institute of Metals, Mining and Metallurgy (UK), The Institution of Civil Engineers (UK), The Institution of Engineers, Australia and the International Society of Offshore and Polar Engineers.

For further details about any of the above projects or related matters please contact Rob Melchers rob.melchers@newcastle.edu.au

[a] Now with ARRB, Brisbane
[b] Conjoint Fellow
[c] Now with Statoil, Norway

Recovery of 150 mm diam. mooring chain at Darwin after 2 years exposure .



SEM view of pipeline under-deposit corrosion.

Pitting of cast iron water pipe (photo courtesy Matt Dafter).

Strategy for a Corrosion Remediation Program

This article is a quick overview of the recommended steps in order to establish a robust corrosion remediation program that delivers a quality result and can be implemented to any future integrity (concrete repair, structural steel replacement and protective coating) remediation works at any mine site.

Stage 1 – Desktop preparation

1.1 Develop a Project Hierarchy

This item may already exist, but if not it is a critical step in Quality Assurance to assign accountability. This item is relatively straight forward to prepare and can be prepared quite quickly.

1.2 Review Specifications

A robust specification reduces exposure by the owner and encourages attention to detail. It reduces the risk of a poor quality works, unsafe works, and incorrect or faulty works being carried out.

An experienced team should review the specifications that will be required by the contractors onsite carrying out the remediation activites. This team will review existing specifications and add clauses and information in line with leading industry best practice.

Specifications are usually attached to, and form part of, contract documentation and are often legally binding. The specification is normally the overriding document for all aspects of the remedial works, testing and acceptance.

Probably the single most important document associated with a refurbishment project is the project specification. The document is usually produced by the end user or their nominated representative/consultant and should set out exactly the expectations of the client at each stage of the repair works, including:-

- A precise scope of what is (and isn't) meant to be repaired
- Pre-cleaning and rectification of fabrication defects
- Method(s) and standard(s) of surface preparation
- The selected repair system(s) for specified surfaces, including a description of the repair materials and QA parameters
- Testing procedures and acceptance criteria
- Touch up and remediation.

The specification should also address other matters such as safety, environmental and waste issues, product handling, transport to site, storage and other general site requirements.

1.3 Review / provide Checklists, Forms, SOP's

Paperwork is a function of Quality Assurance. It records all the pertinent information in regards to the job for future reference and as a checklist as the job progresses to ensure the specification is being met. Poor or incomplete paperwork can compromise traceability and the ability to confirm the required level of quality in a safe manner.

1.4 Prepare Schedule and Assign Fixed Budget

Site based scheduling and budgets should be taken into account but will not be covered in depth here.

1.5 Review Site Instruction Document

The Site Instruction or Work Pack document should contain all information required for the contractor to clearly understand what is required. It should reference Standards and Specifications as well as safety and site requirements. The document should contain the most appropriate technical remedial options to be used on site so that the best return on investment is achieved in a timely and practical manner.

1.6 Develop Inspection and Test Plans (ITP)

Usually the ITP for a particular project will reflect the requirements of the project specification, but will also include additional information such as the contractors instrument calibration records, training records of personnel and, as the project progresses, test results. An ITP should be produced by the contractor, often to comply with a specification requirement. However it has been found acceptable practice for the end user to produce the ITP and keep it as a standard document to be provided with site instructions.

Stage 2 – Site Work Specifics

2.1 Issue identification

Issue capture onsite should be carried out by a suitably experienced person in the field. The aim is to identify issues as well as record information which will allow a concise work pack/site instruction to be developed.

The deliverable for this line item is usually a report which includes:

2.1 Site Corrosion Mapping.

- A summary comment on each issue assessed during the audit, encompassing any inconsistencies with regards to statutory, industry and site standards and surrounding site infrastructure.

- A detailed comment on each issue identified/observed during the audit.

- Those items of non-conformance with relevant standards/codes, site specifications, etc, broken down into the appointed areas of site and sub areas as deemed relevant.

- Quantification and precise location of issue should be included in the recommendations for refurbishment works will also be provided to assist maintenance personnel. (eg; 2 lineal metres of UB150 requires replacing at RL050.15 (level 3) on the South side of the Ball mill right of bolted connection as marked up on drawing G-3020-01.).

- Comment on the suitability of current safety items, devices and equipment employed, including design and procedures, and recommendations for improved corrosion control. This includes recommendations for improved material/system performance in high corrosion risk areas.

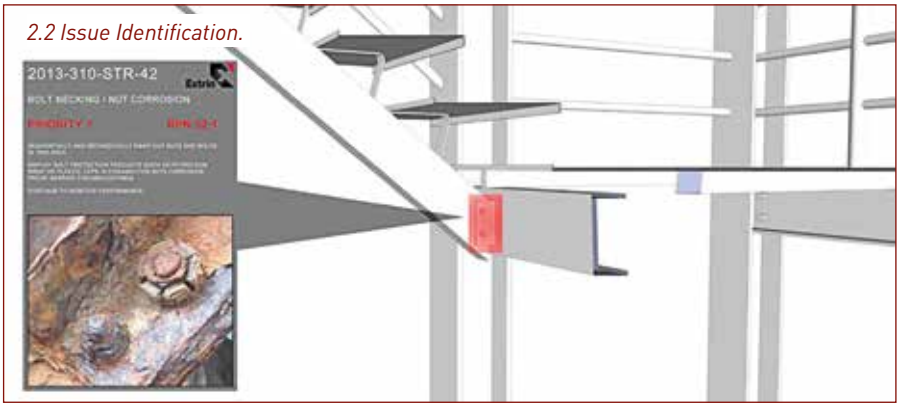
- Recommendations for corrosion protection strategy of aforementioned items for the remaining life of mine.

- Assign assessment rating, and prioritisation of each of the items noted in the audit.

- Comment should also be provided on the performance to date of the assets and include recommendations for extending service life of assets.

2.2 Site Corrosion Mapping

'Corrosion environment mapping' which identifies the different corrosion service environments onsite at a mine site and in turn dictates what products and methods are applicable. This will allow modification of the repair systems to suit the environments specific to a mine site, resulting in a tailored approach to ensure value is being provided to the operation.



2.2 Issue Identification.

The process involves water sample analysis and interpretation, site specific atmospheric corrosion results and observations to produce a Corrosion Map for the mine site. This can be then used for a whole range of specification purposes.

2.3 Contractor review

Understanding the capabilities of the contractor is important to assess if they are deemed suitably qualified and competent for the undertaking of the remediation works. Examination of each contractor and their capability statement to determine if they are suitable should be carried out.

2.4 Ensure coating QA/QC awareness

This item will ensure that both site personnel and contractors are fully aware of the QA/QC requirements as required not only for this project but for future repair works. In general, most site personnel in mining operations have some awareness of corrosion, however not a detailed understanding of the process and QA/QC requirements. By 'up-skilling' site personnel, including supervisors and superintendents, in these fields by way of, for example, a short coating awareness presentation, it has been found that quality of work executed on site by contractors is to a higher standard and thereby ensures that the operation gains the outcomes expected when directing funding to this issue.

2.2 Issue Identification.

Reality Check

It is important to note, when undertaking the issue identification phase by the corrosion specialist that a holistic view of the operation needs to be considered. Some factors that may affect the prioritisation of works and assessment rating are:

- Life of Mine / Operation
- Risk Rating - Likelihoods and probabilities of occurrence
- Possible failure of element – how does this affect operation
- Inherent redundancy in systems, corrosion allowances, interlocks, failsafes, etc
- Other treatment options available
- Future projects or modifications being undertaken in area, and impacts this may have on issue.

The above needs to be undertaken in conjunction with site personnel working collaboratively to ensure risks are adequately identified and assessed, and an appropriate level of treatment is applied in proportion to the level of risk an issue presents – this will endeavour to provide a value assured approach to the mitigation of these risks and funding is being spent in an appropriate and pragmatic manner.

Collaborative article written for the Australasian Corrosion Association by: Stephen Foley a member of the ACA and Regional Senior Civil/Structural Engineering Advisor for Newmont Mining Corporation & Giles Harrison also a member of the ACA and Project Manager at Extrin.

This paper was originally published in the Corrosion & Prevention 2014 proceedings.

Correction to ACA Corrosion & Prevention 2014, Conference Paper 94, entitled 'Fusion Bonded Polyethylene Coatings – 40 Years on'. Error in table 3, paper re-issued herein.

Fusion Bonded Polyethylene Coatings – 40 Years on

A Fletcher[1] & D Nicholas[2]
[1]Pentair Water Solutions Pty Ltd & [2]Nicholas Corrosion Pty Ltd

1. Introduction

When steel pipes were first used for water pipelines in the last quarter of the 19th century, either in riveted or locking bar format, hot applied Trinidad asphaltic bitumen was the standard corrosion protection both internally and externally [1]. In the early 1920's the external coating was reinforced with hessian as an early recognition of soil stress issues.

Hot applied coal tar enamel, as its name suggests is a coal derivative. and with generally reduced water absorption, became an alternative coating in the 1920's. These were also reinforced with hessian and then progressively asbestos fibre matting until glass reinforced fibres became available in the 1960's. The latter coating often had an outer asbestos felt wrap to assist in resisting soil stress effects. By the early 1970's this coating system remained the default protection for all buried steel pipelines, both oil & gas and water. Nonetheless the coating system had a low strain tolerance and was susceptible to soil stresses, especially on larger diameter pipelines. Experiences of coal tar coating failures on water pipelines in 1971 (see photos of soil stress failures Figures 1 and 2) led the State Rivers & Water Supply Commission (SR & WSC - Victoria) to explore alternative coating systems. Concurrently a local steel pipe manufacturer began applying a fusion bonded polyethylene (FBPE) coating. That coating system was first used in 1972 and so began the use of a new pipeline coating system that has now been in use for over 40 years.

2. History of Use

2.1 Australia

The first use of the emerging technology FBPE coatings in Australia was by the SR & WSC in early 1972. The coating system was applied at a minimum thickness of 1mm, was yellow in colour and contained a patented blowing agent which produced a porous region in the coating at the steel surface with the intention of "aiding" adhesion [2, 3]. After several months in storage it became apparent that the coating had insufficient ultraviolet ray stabilisation and poor adhesion, as evidenced by cracking of the coating and delamination at pipe ends. Information was sought from European steel pipe and coating companies that had been applying FBPE coatings for over 10 years [2]. The European technology was transferred to Australia in 1973 and the non-patented FBPE coating that was then applied, was a black (containing at least 2% of carbon black) low density polyethylene applied at thicknesses from 1.8 to 3.0mm with the thickness increasing with pipe diameter [3].

The application process involves grit blasting the outside of the pipe, then heating it to approx. 300°C (typically by direct gas flame impingement), dipping in a bath of fluidised polyethylene powder whilst the pipe is rotated, then allowing the molten polyethylene to solidify. During application the first particles of polyethylene are transformed and the functional groups formed provide the adhesion to the steel. The coating thickness is built up by a simple melting process as the pipe is rotated in the bath. When removed the coating continues to melt-through until a smooth outer surface is formed.

In the 1970's there were steel pipe manufacturing plants in every state and, because the only FBPE coating facilities were in Melbourne, supply of FBPE coated pipe was confined to Victoria until 1984. In the first 10 years of supply over 400km of steel pipe was coated with FBPE in sizes from 114mm to 1752mm in diameter. Of interest was the application of the coating system to 33km of 114mm diameter x 12.5mm wall thickness oil pipe (in 1978) that was welded into a continuous "string", reeled onto a 4m diameter drum and unreeled into Bass Strait. The pipeline conveyed hot oil at 100°C. A photograph of the reeling operation is shown in Figure 3.

The application of the coating was initially governed by a SR & WSC specification. With that as a starting point, and considering other standards such as the German standard DIN 30670 [4], an Australian standard for FBPE coatings was published in 1982 [5].

In the mid 1980's FBPE coated pipes became readily available in NSW, Queensland, South Australia and Tasmania, with the final steel water pipe plant in Western Australia being converted in 1989. During this period most pipes coated were for the water industry with some oil and gas pipelines being coated, particularly for offshore applications. In 1985 the coating system was first applied to the ends of elastomeric jointed pipes, together with the water industry's preferred cement mortar lining, this meant that no field joint coating was required – see Figures 4 and 5.

In 1991 the FBPE system was extended to line steel pipes, either solely as a lining or in combination with the FBPE external coating [6]. The coating formulation remained constant throughout this period until the development of new stronger and tougher polyethylenes in the 1980's that led to a development program to explore their suitability as FBPE coatings. In 1993/4 a new medium density FBPE coating became available with higher strength, higher toughness / impact resistance and higher resistance to temperature [7]. The new coating was applied at thicknesses in the range 1.6 to 2.3mm with the thickness increasing with pipe diameter.

Figure 1: Coal tar enamel coating showing crown cracking on 914mm pipeline - 1971.

Figure 2: Coal tar enamel coating showing coating deformation on 914mm pipeline - 1971.

Despite the decrease in applied thickness the impact resistance of the new medium density FBPE delivered improved adhesion, increased resistance to penetration and an average 10% increase in impact resistance [7]. A new Australian Standard was developed to cover medium density FBPE in 1995 [8]. The "new" MDPE formulation has remained the same since 1993.

The other development over the past 20 years has been the increased capability in coating fittings. In addition to RRJ fittings, a large range of fittings, including large diameter fittings with compensating rings, can be coated.

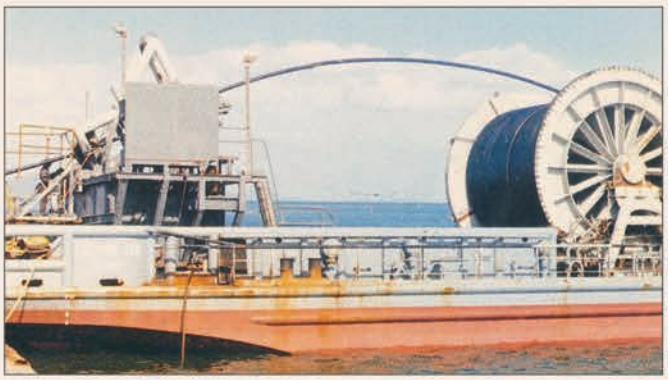


Figure 3: 114mm diameter steel pipe coated with FBPE being reeled onto a large barge – circa 1979.

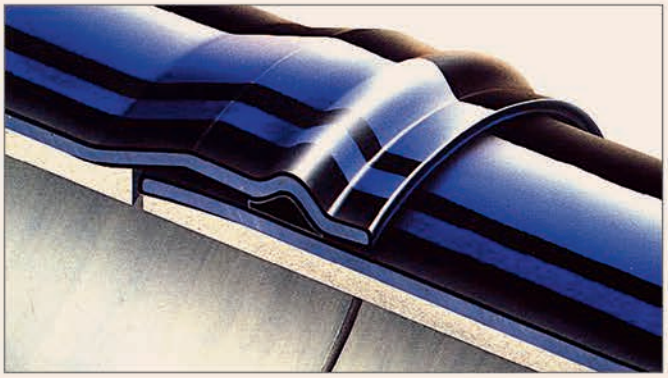


Figure 4: Schematic view of FBPE applied to elastomeric joints – as used in the water industry.

Figure 5: Photo of elastomeric socket coated with FBPE – as used in the water industry.

2.2 South Africa
In 1993 the capability to apply FBPE coatings with elastomeric joints was established in South Africa to compete with hot bitumen applied coatings. A South African Standard was developed to cover the coating system in 1995 [9]. Pipes continue to be coated with FBPE in South Africa with the MDPE material having been introduced in 1997.

2.3 Other Countries
Over the years of coating application notable steel water pipeline projects coated with FBPE have been supplied to places such as Singapore (for the NEWater project) and Abu Dhabi.

In the USA a FBPE coating standard was developed in 2008 based on medium density polyethylene [10], as a precursor to supply of FBPE coatings.

In Europe FBPE coatings have been applied since the 1960's. From the 1980's production has been confined to a small number of applicators as most production was converted to extruded polyethylene coatings which are more cost effective for long production runs and smaller diameter pipe. Extruded polyethylene was also used for oil and gas pipelines in Australia as most pipe diameters were less than 500mm. FBPE is more cost effective for short production runs and larger diameters.

3. Service Performance

3.1 In Service Inspections
A number of in service inspections have been performed in conjunction with end users over the 40 years FBPE coatings have been used. The focus has been on the older pipelines as detailed below.

Site 1 - A 724mm diameter buried steel water pipeline installed in 1983 was examined in November 1991 in conjunction with the owner/operator, GWMWater (formerly Horsham Water Board) and an industry expert who had worked at SR & WSC.

Site 2 - A 724mm diameter buried steel water pipeline installed in 1977 was examined in November 1991 in conjunction with the owner/operator, GWMWater and the industry expert. The pipeline inspected at Site 1 was an extension of this pipeline.

Site 3a - An 813mm diameter above ground section of steel water pipeline in Geelong was examined. It was installed in 1978, and was examined in December 2004 in conjunction with the owner/operator, Barwon Water. A second examination was undertaken at this site, immediately adjacent to the original site, in December, 2013 with Barwon Water and a Research Engineer from CSIRO.

Site 3b - An 813mm diameter buried steel water pipeline in Geelong was examined. The pipeline is an extension of the above ground pipeline discussed above in Section 3a. It was examined in December 2004 in conjunction with the owner/operator Barwon Water. A second examination was undertaken at this site, immediately adjacent to the original site, in December, 2013 with Barwon Water and the CSIRO researcher.

Soil samples were taken to access the corrosivity of any imported surround material as well as the native soil. The results showing saturated soil resistivity and linear polarisation resistance are shown in Table 1 together with an overall soil corrosivity classification. At Site 1 the soil was waterlogged and was classified as being corrosive. No samples were taken from Site 2, which had a sand surround. Site 3 also had a sand surround classified as non-corrosive, however the surrounding soil was corrosive.

Table 1 Soil Assessment Results.

Sample	Texture/colour	Saturated resistivity	Rp (average)	Normalised pitting rate	Estimated Soil corrosivity
Site 1, native soil	Orange brown clay	860 ohm.cm	Not done	Not estimated	Corrosive
Site 3, pipe surround material	Sandy brown loam	14,182 ohm.cm	151 ohm	0.05 mm/yr	Non-corrosive
Site 3, native soil	Dark greyish brown clay loam	800 ohm.cm	22 ohm	0.4 mm/yr	Corrosive

A range of tests were undertaken on the coated pipes both in-situ and on samples tested in the laboratory. The site tests undertaken were visual inspection, bond (adhesion) testing, hardness testing, and impact testing. Other laboratory tests undertaken were oxygen induction temperature, oxygen induction time, yield strength, elongation, environmental stress cracking resistance (ESCR) and indentation. A summary of the test results is shown in Table 2 and photographs taken during the inspections are shown in Figures 6 to 11.

Visual inspection during all examinations showed the coating was in excellent condition, with no signs of cracking, blisters, etc at any of the sites.

Bond testing at all sites showed that the minimum requirement of 2.5N/mm was easily met except where the bond was so high that the coating broke before peeling occurred. The high bond strength meant that only two samples of sufficient coating size could be removed for the yield strength, elongation and ESCR tests.

Hardness testing indicated no significant change in coating performance. Note the changes in hardness recorded are relatively small in relation to the uncertainty of measurement of the test.

Impact testing was done in accordance with the German standard DIN 30670 as this was the most relevant standard that contained requirements for impact testing of low density FBPE coated pipe. The coating easily withstood the required impact when high voltage continuity tested at 15kV. At site 3 the pipe was on a slope so the impact (which had to be done vertically) was a slightly glancing blow. To account for this geometrical restraint, a higher impact energy of 18J (44% above the minimum requirement) was employed. The coating passed this test exhibiting compression of the coating, with no cracking evident, as would be expected from newly applied coating.

Table 2 Summary of Test Results.

Property	Site 1 – Horsham, 8 years old	Site 2 – Horsham, 14 years old	Site 3 – Geelong, 26 years old	Site 3 – Geelong, 35 years old	FBPE applied to AS 2518	
					Requirements	Typical initial values
Bond (adhesion) Strength	Could not peel, > 4 N/mm	Could not peel, > 6.5 N/mm	Could not peel, > 6 N/mm above and below ground	Could not peel, > 2.2N/mm above ground, > 3.5N/mm below ground	≥ 2.5 N/mm (AS 2518)	4 – 8 N/mm
Hardness (Shore D)	46 – 52	50 – 52	52 above and below ground	52 – 56 both above and below ground	None	50 - 52
Impact DIN 30670 – 25mm tup	Passed at 15 J	Passed at 15 J	Passed at 15 J above and below ground	Passed at 15J and 18 J both above and below ground	> 12.5 J (DIN 30670)	> 12.5 J
Oxygen Induction Temperature	Not done	259°C	256°C above ground, 253°C below ground	Not tested	> 230°C (AS 1463)	256 – 264°C
Oxygen Induction Time	Not applicable	Not applicable	24 minutes below ground, above ground not tested	24 minutes above ground, 28 minutes below ground	> 20 minutes (AS/NZS 4130)	30 – 40 minutes
Yield Strength	9.1 MPa	9.0 MPa	Could not remove coating for testing	Could not remove coating for testing	≥ 9.0 MPa (AS 2518)	9.0 – 10.0 MPa
Elongation at break	320%	310%			≥ 300 % (AS 2518)	300 – 400 %
ESCR, F50	5 hr	5 hr			≥ 3 hr (AS 2518)	3 – 5 hr
Indentation	0.12 mm	0.11 mm			< 0.3 mm (DIN 30670)	0.10 – 0.15 mm

The oxygen induction test provides a good measure of the thermal resistance of polyethylene, and provides information on its remaining life. The oxygen induction temperature, determined in accordance with AS 1463 [11] is the temperature at which decomposition occurs in still air whilst the temperature is raised at a fixed rate. This method was the specified method for polyethylene pipes in the 1980's and 1990's and required a result of ≥ 230°C on new as-produced pipe to pass.

Currently the oxidation/ageing resistance requirement for polyethylene pipes is given in AS/NZS 4130[12], which references the ISO test method - ISO 11357-6 for oxygen induction time. This test measures the time to commencement of degradation in oxygen at a constant temperature of 200°C. Polyethylene pipe supplied in 2014 has to meet a requirement of ≥ 20 minutes in this test. Both methods provide good measures of the oxidation/ageing resistance of polyethylene, and provide information on its remaining life.

As testing for polyethylene oxidation resistance is generally now only conducted to ISO 11357-6, that method was exclusively used post 2004. The results show no deterioration at test Site 3 from 2004 to 2013. The results also show that for all samples tested the material would meet the requirements for newly applied polyethylene, even after 35 years service above ground (the most onerous exposure).

As discussed above the very high adhesion of the FBPE coating at Site 3 meant that only sufficient coating for mechanical testing could be obtained from Sites 1 and 2. Such testing is also made more difficult as imperfections in the coating can lead to premature fracture. Nonetheless the yield strength, elongation at break, ESCR and indentation test results all met the requirements specified for newly applied coating.

In summary the in service inspections have shown that there has been no significant deterioration of the FBPE coating after service for up to 35 years in both above and below ground service conditions. Based on these results the FBPE coating would be expected to provide a service life well in excess of 100 years where buried and 50 years above ground.

Figure 6: Site 1, Horsham, 1991, showing the 8 year service, 724mm pipe, and preparations for impact testing.

Figure 7: Site 2, Horsham, 1991, undertaking the bond adhesion test on the 724mm diameter, 14 year service pipe.

Figure 8: Site 3, Geelong, 2004 & 2013. Above ground pipeline section.

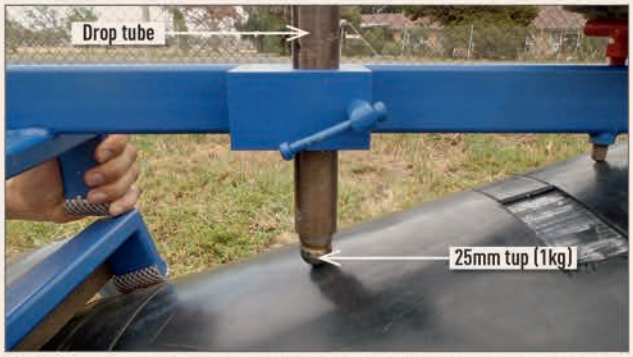


Figure 9: Site 3, Geelong, 2013. Impact test set up on the above ground section.

Figure 10: Site 3, Geelong, 2004. Buried pipe showing impact test indentation and bond test.

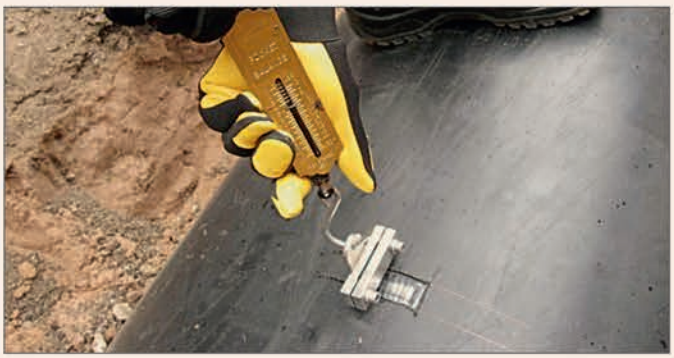


Figure 11: Site 3, Geelong, 2013. Bond testing the buried pipe.

3.2 Long Term Testing

Long term testing has been undertaken on medium density FBPE coatings in chemical resistance testing for up to 12 months in a range of "contaminated" waters and on small plates subjected to a range of environments for up to 10 years.

3.2.1 Chemical Resistance Testing

Inorganic chemicals normally found in soils and waters have no significant effect on FBPE, but there was less information on the performance in contact with potentially aggressive petroleum products. CSIRO was commissioned to undertake testing on steel panels (100mm x 50mm x 8mm) coated with medium density FBPE exposed to a range of petroleum products spanning the C6 to C30 fractions. The panels were subjected to various concentrations of unleaded petrol, diesel, kerosene, toluene, xylene, and lubricating oil in aqueous solutions and in sand. The panels were then visually inspected for corrosion, change in material appearance, weight change and hardness change. The work was done to better predict the performance of FBPE coatings when buried in contaminated soils. The results are shown in Table 3.

The results show that for most contaminated soils, with concentrations of petroleum products up to 2,000ppm, that there is no significant change in the properties of medium density FBPE coatings.

Table 3 FBPE Coated panel Results after Exposure to a Range of Petroleum products for 12 Months.

Immersion fluid	Medium density FBPE coated steel (starting hardness 57)			
	Average %wt change (2 samples)	Shore D hardness sample 1	Shore D hardness sample 2	Visual observations
Unleaded petrol				
100%	10.3	53	50	Slight dulling of surface only
500 ppm	0.1	58	57	No change
2000 ppm	0.3	59	58	No change
2000ppm in sand	0.3	56	55	No change
Diesel				
100%	6.7	53	52	Slight dulling of surface only
500 ppm	0.4	58	57	No change
2000 ppm	2.2	56	55	No change
2000 ppm in sand	2.9	56	57	No change
Kerosene				
100%	8.1	53	53	Slight dulling of surface only
500 ppm	0.2	55	60	No change
2000 ppm	1.2	53	56	No change
2000 ppm in sand	2.0	56	58	No change
Toluene				
100%	10.8	50	53	Slight dulling of surface only
500 ppm	0.0	55	56	No change
2000 ppm	0.3	60	60	No change
2000 ppm in sand	0.1	63	55	No change
Xylene				
100%	11.0	50	52	Slight dulling of surface only
500 ppm	0.2	53	53	No change
2000 ppm	0.5	53	54	No change
2000 ppm in sand	0.3	59	57	No change
Lubricating oil				
100%	1.0	53	50	No change
500 ppm	0.2	56	56	No change
2000 ppm	0.6	55	57	No change
2000 ppm in sand	0.3	55	57	No change

3.2.2 Exposure to a Range of Environments for up to 10 Years
Soon after the introduction of medium density FBPE coatings in 1993 SA Water undertook testing on a number of FBPE coated steel panels. Panels of size 150mm x 100mm x 3 mm, with an average coating thickness of 1mm, were exposed to raw sewage and sewer gas. Panels of size 600mm x 150mm x 6 mm, with coating thicknesses above 1.3mm, were exposed to full and half immersion in fresh water and to a rural atmospheric environment. Photographs taken at the test sites are shown in Figures 12 to 15.

Small test panels were supported vertically and half immersed in flowing raw sewage at the Bolivar Waste Water Treatment Plant which is located north of Adelaide (see Figures 12 and 13). The vapour space is supplemented with the addition of chemically pure hydrogen sulphide gas and maintained at approximately 40 to 50 ppm. Panels were removed, cleaned and assessed at 6 monthly intervals. One panel had been under test for 7 ½ years and the other for 8 ½ years. No rusting, blistering or other changes have been observed during this time exposed to raw sewage and sewage gas. It is of interest to note that most high performance protective coatings fail or show signs of failure in this test in less than 2 years.

Large panels were supported vertically in timber frames which were supported by a floating pontoon moored in the River Murray at Morgan in South Australia (see Figure 14). The upper panel was half immersed in water with its upper half exposed to shaded rural atmospheric exposure and a narrow zone of splashing. A fully immersed panel was fixed directly below the half immersed panel. The panels were assessed after 10 years exposure when no rusting, blistering or other changes were observed after these river exposures.

Large panels were fixed to test racks which face a northerly direction at an inclination of 45˚. The site is located on the cliffs above the River Murray at Morgan where high UV and summer temperatures in excess of 40˚C are experienced. The FBPE coated panels were last assessed after 10 years exposure, when minor chalking (Rating 9 to AS/NZS 1580 Method 481.1.11) was observed. No other changes were evident.

In summary this testing reinforces the expected high longevity of FBPE coatings in a range of severe environments.

Figure 13: Sewage test rack.

Figure 14: Murray River Pontoon for immersion exposure.

Figure 12: Sewage test chamber.

Figure 15: Atmospheric test racks at Morgan.

3.3 Cathodic Protection

Cathodic protection (CP) is often applied as a secondary protection for water pipelines, and is mandatory for oil and gas pipelines. As a result of long-line corrosion effects, including telluric currents, it is prudent to cathodically protect electrically conductive steel pipelines that are either critical, or of significant length. With the advent of FBPE coatings on elastomeric jointed pipe in 1985 the question was posed: is it prudent / cost effective to cathodically protect such non-electrically conductive pipelines? Different Water Agencies took different approaches with some opting for elastomeric jointed pipelines without the application of CP, whilst others used either applied CP on elastomeric jointed pipelines or on welded pipelines (or a combination of both). One study involved a prominent cathodic practitioning expert, one of the authors and a major water authority in the mid 1990's. The outcome was the flow chart shown in Figure 16. The water authority adopted a more extensive version of that shown in Figure 16.

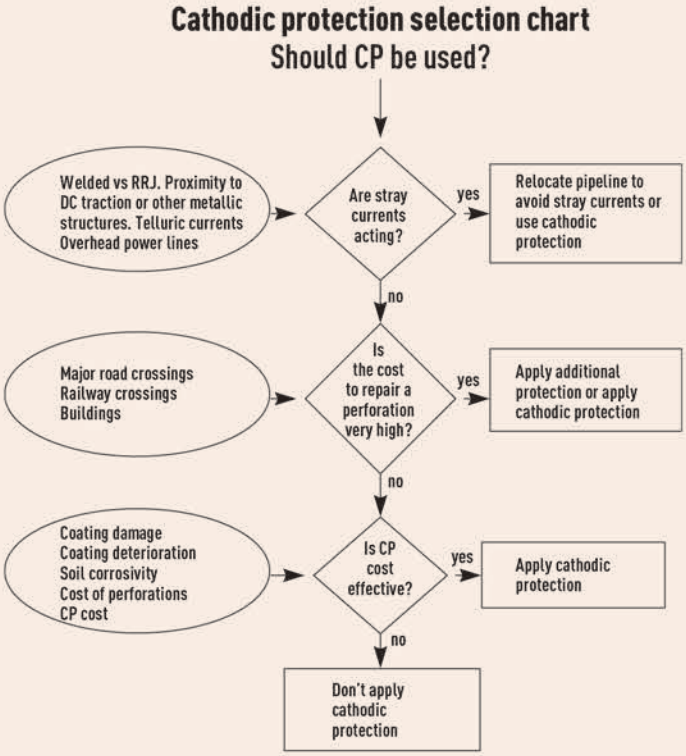


Figure 16. Selection chart to determine the desirability or not for CP.

Where elastomeric jointed pipes are used, and CP is specified, the use of joint bonding cables are needed to electrically connect the pipes. The only major detrimental aspect of applying CP to any bonded pipeline is the possibility of breakage of the bonding cables, which must then be located through continuity surveys. To minimise the risks of this the installation of CP lugs has evolved over the years to that in predominate use today. CP lugs are normally attached to pipes prior to the application of the FBPE coating so that the only attachment required in the field is to attach a copper cable, via crimping, followed by a heat shrink sleeve over the cable junction. A typical assembled joint cable is shown in Figure 17.

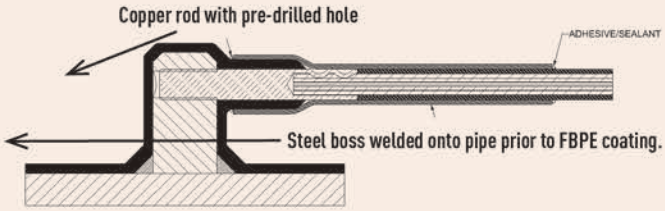


Figure 17: Schematic view of cathodic protection lugs attachment.

Where CP is applied the determination and monitoring of CP current demand is an indicator of possible coating deterioration, though other factors also need to be considered. Verbal information provided by a number of CP practitioners indicates that the current demand of FBPE coated pipelines is typically in the range 5 – 10 μA/m² initially, with little increase during service. CP current demand data also necessarily includes the demand from field joint coatings which typically draw higher currents and are more susceptible to deterioration. Nonetheless details of CP current demand were sought from a large number of water agencies and consultants, but to date only data from 8 pipelines has been received and 7 of those were only in the as-commissioned state. The results of the 7 as-commissioned pipelines are shown in Table 4. It can be seen that initial current demand of the order of 5 – 10 μA/m² can readily be achieved. The reasons for the high demand on two of the pipelines (excluding the one subjected to stray currents) has not been determined, and include a range of possible causes including coating damage, over – protection, leakage to other structures, poor joint coatings, stray currents, etc.

Some data was also provided on a 35 year old 559mm diameter 5,100m long pipeline in Baccus Marsh, Victoria. The current demand was 96 μA/m² after 35 years, which included 25m of bare pipe, which would be expected to account for most of the current demand.

Table 4 FBPE Cathodic Protection Current Demand Data.

Location	Year installed	Pipe Diameter (mm)	Pipeline length (m)	Current demand (μA/m²)	Comment
Melbourne metropolitan area	2006	900	3000	77	Stray current affected
Melbourne metropolitan area	2010	1200	3000	7	
Melbourne metropolitan area	2012	660	1660	10	
Melbourne metropolitan area	2013	660	1600	4	
Regional Victoria	2012	520	500	9	
Sydney area	1992	914	1006	48	Tape joint coating
Regional NSW	1996	1062	1573	57	Tape joint coating

4. Joint Coatings

Tape wrap field joint coatings were the traditional field joint coating applied to FBPE coated pipes. In the 1970's bitumen tapes were most prevalent though today the butyl tape systems, with improved adhesion and strength are preferred.

In the 1980's water agencies started using heat shrink sleeves (HSS). Advantages included better adhesion, elimination of the gap/void that is unavoidable at every overlap in tape coatings, and a significant reduction in the number of coating "steps" at overlaps. The main negative of HSS coatings is the need for pre-heat, which can be difficult to achieve on large diameter water pipelines, and hard to assure the minimum requirement has been met.

The water industry took notice of what was done with HSS application on gas pipelines that were in service. As it's not possible to significantly raise the temperature of such pipes, a primer was applied. Based on that, it is now common to specify a primer for use with HSS in the water industry. Using a butyl primer gives the best adhesion results and when applied immediately prior to HSS application, the minimum required pipe temperature is only 3°C above the dew point. Using a primer not only eliminates the need for pre-heat, it also eliminates the major risk in applying HSS, that of assurance that the minimum temperature has been obtained at all places on the surfaces to be coated. It also means the required pre-heat is the same as that for tape coatings.

5. Conclusions

This review aimed to examine the performance of Fusion Bonded Polyethylene (FBPE) coatings, which have now been in service for 40 years. The use of FBPE coatings has been documented for the past 40 years. Service performance has been reviewed by providing details of coating inspections on operating pipelines up to 35 years old. Data on the performance of FBPE subjected to a range of possible petroleum soil contaminants for a 12 month period has been detailed. Water Agency exposure testing for 10 years in a range of environments has been reported. The use of FBPE with cathodic protection has been reviewed and the changes in field joint coatings used on FBPE water industry pipelines are covered.

Taking into account all the information obtained, it is concluded that FBPE coatings have lived up to the expectations of 40 years ago and today continue to provide excellent corrosion protection for steel pipelines where a long service life is required.

6. Acknowledgments

The authors which to acknowledge the valuable data and input provided by the following people / organisations:

P Vince (SA Water)
Barwon Water
GWMWater
R Cox (Pipecorr)
J Sunarho & G Dent (Sydney Water)
G Moore
B Gerritsen (Australasian Corrosion Consultants Pty Ltd)
P Fernandez, L Tuazon & R Franklin (Western Water)
Horsham Water Board

7. References

[1] Nicholas D and Moore G, Corrosion of ferrous watermains: Past performance and future prediction – A review, ACA Conference 2007

[2] Hirth G, Polyethylene coatings for steel pipes, Journal of SR & WSC, Spring 1975

[3] Hirth G, Polyethylene coatings for steel pipes, ACA Conference 1976

[4] German Institute for Standardization, DIN 30670-1980, Polyethylene sheathing of steel tubes and of steel shapes and fittings

[5] Standards Australia, AS 2518-1982, Fusion-bonded low-density polyethylene coating for pipes and fittings

[6] Fletcher A, Fusion bonded polyethylene lining for wastewater pipelines, ACA Conference 1992

[7] Fletcher A and Thomas R, A new fusion bonded medium density polyethylene pipe coating, ACA Conference 1993

[8] Standards Australia, AS 4321-1995, Fusion-bonded medium-density polyethylene coating and lining for pipes and fittings

[9] South African Bureau of Standards, SABS 1641-1995, Fusion-bonded low-density polyethylene coating for pipes and fittings

[10] American Water Works Association, AWWA C229-08, Fusion-bonded polyethylene coating for the exterior of steel water pipes and fittings

[11] Standards Australia, AS 1463-1988, Polyethylene pipe extrusion compounds

[12] Standards Australia, AS/NZS 4130:2009, Polyethylene (PE) pipes for pressure applications

AvantGuard® Redefining anti-corrosion

Hempel introduces AvantGuard®, a new innovative anti-corrosion technology, based on activated zinc and locked into our new range of high performance protective coatings.

AvantGuard® reduces the effects of corrosion and offers advanced protection. This increased durability has been proven in extensive tests.

Redefining protection with reduced rust creep and enhanced corrosion protection

Redefining durability with improved mechanical strength

Redefining productivity with greater working tolerances in different climatic conditions and with high DFT's. Less repair work needed.

Redefine your expectations of anti-corrosion coatings with **AvantGuard®** by Hempel.

HEMPEL