ACA BRANCH

NEW ZEALAND BRANCH

DECEMBER 2023 Volume 66, Issue 11. Online: www.corrosion.com.au

The ACA New Zealand Branch wishes all Members a safe and happy Christmas break in 2023.

We look forward to catching up with everyone in 2024!

CORROSION & PREVENTION-23

PERTH, WESTERN AUSTRALIA, 12-16 NOVEMBER 2023

"INFRASTRUCTURE IN AN AGE OF SUSTAINABILITY"

The annual ACA Conference was held this year at the Convention & Exhibition Centre in Perth. Attended by over 300 delegates and with 65 trade booths, there were lots of interesting activities going on at all times. There were 10 New Zealanders present from around the country. Willie Mandeno and Grant Chamberlain represented NZ Branch at the annual Council Meeting held on the Sunday before conference started.

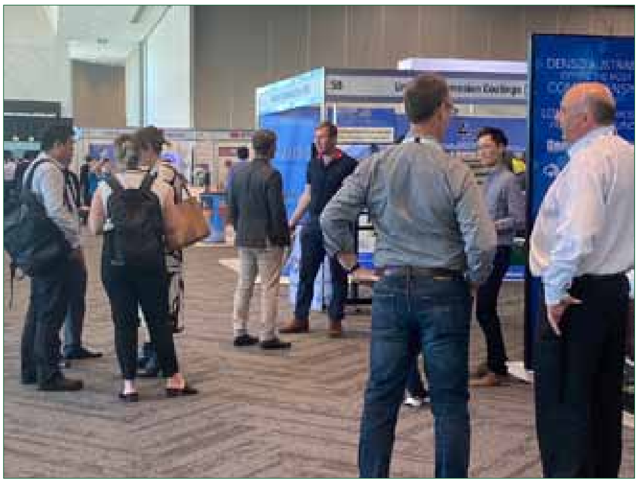
The Welcome Function on Sunday evening was followed by the official Opening Ceremony on Monday morning, which included addresses by CEO Maree Tetlow and ACA President Isaac Isakovich. Then four streams of papers (65 in all) and nine forums were presented over three days. The annual P F Thompson Plenary Lecture was ably presented by Assoc-Professor Geoffrey Will. Many of the papers presented were focused on various aspects of the conference theme "Sustainability". *cont'd pg 2*

CP-23 Report - continued

At the annual Awards Dinner held at the Optus Stadium, Professor Nick Burbilis received the prestigious Corrosion Medal. Amongst the many ACA awards presented was the NZ Branch-sponsored ACKennett Award; Willie Mandeno received a service award for course training; the first Les Boulton Case Study Award went to Allan Sterling & Kate Hine from Queensland Branch.

The Farewell function on Wednesday evening was a gathering of delegates from a number of countries who socialised and conversed about conference activities. On Thursday there was the annual Applicators Day where trade exhibitors gave equipment demonstrations and technical presentations. As always, the Perth ACA Conference was a great opportunity to network, learn and socialise with fellow ACA members. The 2024 ACA Conference is to held in Cairns from 10-14 November – mark your diary now!

Report from Les Boulton



FIRE CONFERENCE JUDGED A GREAT SUCCESS

On November 6th, the joint ACA NZ Branch and SESOC (Structural Engineers Society) conference entitled Protecting Structures from Fire, was held in Auckland's Ellerslie Event Centre. Attendees witnessed a remarkable showcase of expertise in the field of fire protection of structures, whether steel, concrete, or timber structures, covering topics relating to structural design, fire engineering, to the selection, specification and inspection of passive fire protection. This included:

- Explaining the basics of Fire Engineering 101 around the scope, objectives and compliance pathways/documents.
- Covering the role and responsibilities of the structural engineer with respect to design, coordination and documentation to meet the requirements of the fire report. A high-level overview of compliance pathways will be given followed by key tips and tricks from an experienced consulting engineer.
- A review of fire safety in mass timber buildings, with structural calculations for fire resistance of mass timber elements and a lot more.
- Providing an introduction to fire resistance testing, its benefits and limitations, and discuss intumescent coating systems in New Zealand and the New Zealand International Convention Centre project.

The event drew a full house with 150 in attendance, reflecting the enthusiasm and engagement of professionals keen on advancing their knowledge in structural safety.

The conference brought together a diverse group of professionals from various industries, fostering a dynamic and fruitful exchange of ideas. The conference room buzzed with energy as participants engaged in insightful discussions, with a particular focus on the perspectives and contributions from structural engineers.

Throughout the conference, attendees were treated to a wealth of knowledge, from the role of structural engineers in ensuring fire safety compliance to the intricacies of fire resistance testing and the practical applications of intumescent coating systems.

The success of the conference was underscored by the active participation of structural engineers, who formed a significant portion of the audience. Their keen interest and involvement showcased the importance of continuous learning and collaboration in the ever-evolving field of fire engineering.

In summary, the joint effort of ACA and SESOC, in collaboration with Proconsult, resulted in a highly successful conference that not only showcased the expertise of notable speakers but also fostered meaningful discussions among professionals, with structural engineers taking a prominent role in the exchange of ideas and knowledge.

by ACA NZ members
Hanieh Ghominejad & Raed El Sarraf

STRAY CURRENT CORROSION AND PREVENTIVE MEASURES

by Grant Chamberlain, CPNZ

Stray current corrosion will only affect metallic structures, typically pipelines, in an electrolyte (buried in soil or immersed in water). Generally, the longer the structure, the more susceptible the structure is.

How stray current works:

There must be at least two structures in the electrolyte;

One structure (1) has current flowing in it trying to get back to electrical earth.

The other structure (2) may or may not have Cathodic Protection (CP).

So long as structure 1 is the "path of least resistance" back to electrical earth, there is generally no problem. But if structure 2 is the path of least resistance, the current will jump off 1 and onto 2 at a coating defect, then at another coating defect it will jump off 2 to get back to 1, or directly to electrical earth.

Corrosion occurs when the electrical current arrives at and/or leaves a structure through the electrolyte (soil-water). The steel at a coating defect where the current leaves the structure loses electrons and will corrode i.e. the steel (Fe) turns into rust (Fe^{++}) because electrons (e^-) have been lost.

Unless there are sufficient replacement electrons from the CP system (if fitted) to maintain the steel at an "immune from corrosion state," significant corrosion will occur.

The rate of corrosion is, for every amp of DC current leaving the pipeline, 9kg of metal is lost per year. When this is converted to a real life situation, a 6mm-diameter coating defect on a 6mm-thick pipe with a cone-shaped metal loss profile, perforation could be achieved in 16 hours.

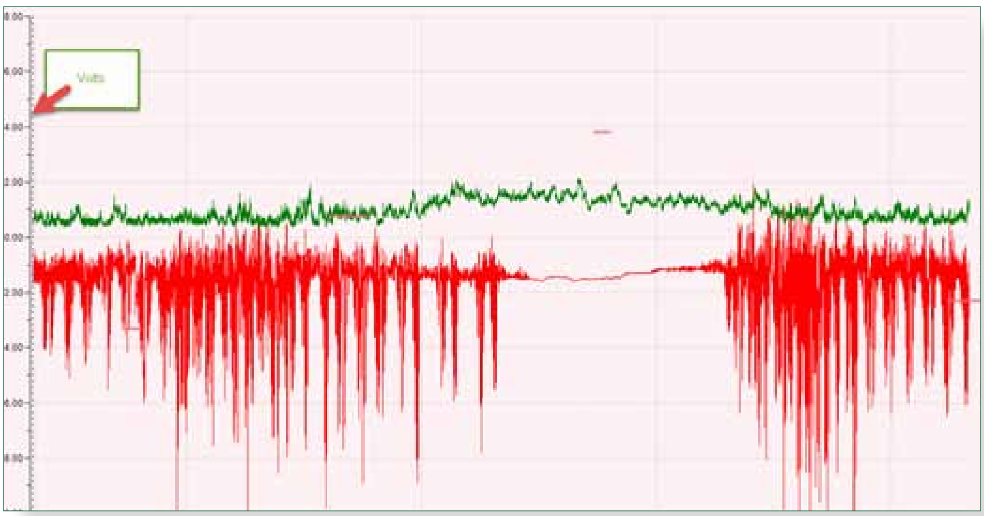
There are several ways to prevent this:

- It can be eliminated by bonding the two structures together.
- It can be reduced by putting a resistive bond between the structures.
- Structure 1 can be made more conductive.
- Resistance can be increased between the two pipelines, either by improving the coatings or putting in a dielectric shield between the two structures.

Identifying areas of possible interference is difficult. Ideally, this is performed during construction of the second structure. At this point, monitoring test points can be installed.

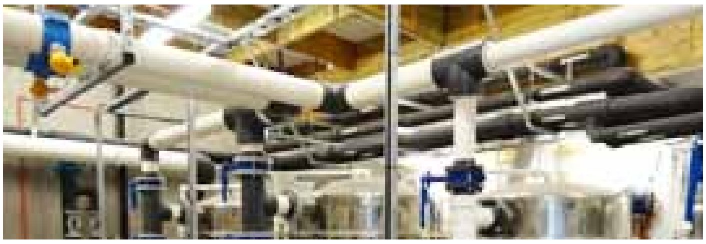
With existing systems, a tool called a Current Mapper can be used, which may detect current leaving the system that it is connected to. There are AS/NZ Standards that stipulate the requirements regarding stray currents.

Asset owners and CP service providers should participate in the ACA NZ Electrolysis Committee to share information and/or education about stray currents and asset location. Contact Grant Chamberlain, NZEC Chair at grant@cpnz.kiwi for more information.



At right is an example of the stray current caused by the DC rail system in Wellington.

The smoother section is at night, when there are no trains running.



Q & A CORNER

Older ACA NZ members have probably seen a number of situations that may never have made it to a textbook.

If you have a question you'd like clarification on, email it to the Editor at lesboultonrust@gmail.com. We'll pose it to our panel of experts who will answer it in another Bulletin, so everyone can improve their knowledge.

Q:

Can a structure's design help control corrosion?

& A: *Yes!*

Designers need the skills to determine the properties and mechanical strength required to ensure that a structure will be resistant to corrosion in service.

The general rule for proper design is to avoid heterogeneities. For example, heterogeneities may consist of different metals in contact, uneven stress, or variable temperature distribution.

Here are some design guidelines that can be followed:

- Adjust the wall thickness. Generally, build in a corrosion allowance on steel pipes, tanks and other parts. This allows for a gradual reduction in the steel wall thickness due to corrosion. Life cycle costing may dictate the use of a high alloy that does not need a corrosion allowance at all.

- Ensure there is adequate drainage. Tanks and other storage containers should be designed so they can be easily drained and cleaned. All transitions should be smooth, and taps/nozzles should be located where a tank can be easily drained.

- Avoid galvanic corrosion. Use compatible metals throughout the structure, and avoid electrical contact by insulating different metals where contact is necessary.

- Avoid crevice corrosion. To avoid crevice corrosion, sealants can be used and pressure adjusted on gaskets to prevent liquid penetration inside the crevice. This avoids the formation of an electrolyte film inside a crevice as well as tight gaps, which can accelerate crevice corrosion.

- Minimise temperature gradients. Equipment used for heat movement should be designed so that the surface temperature varies as little as possible.

- Minimise stress gradients. Stress concentrations in components exposed to corrosive media should be avoided, especially if using a material susceptible to stress corrosion cracking. Aim for simple geometry, because abrupt changes in dimensions can provide a site for such gradients.

- Minimise turbulence in piping systems. The design should allow for fluid flow with minimum turbulence, which can enhance erosion-corrosion. The fluid flow should be laminar and the thickness of the structure enough that it can bear any corrosive effects. Minimise the number of bends and round off sharp bends to avoid erosion-corrosion.

- Separate environments. Consider the structures surroundings to minimise the consequences of any type of corrosion that may occur on adjacent plant. Make sure that systems don't impair the environments of adjacent structures.

Acknowledgement: Corrosionpedia

ROTORUA COUNCILLORS TO PAY FOR 'COST SAVINGS' 16 YEARS AGO

from John Duncan, ACA NZ member

Who among us in the corrosion community was surprised at the Rotorua Daily Post article on 11 November telling us that Rotorua councillors had decided to spend $40,000 to remove the distinctive - but corrosion-damaged - metal "fins" from the facade of the Energy Events Centre at Sulphur Point (a spot well-known for geothermal activity), opened in 2007?

As early as 1981 the atmospheric corrosion map for NZ had warned about the need for special care in materials selection in the geothermal region, and NZS 3604 had from the 1990s warned about the corrosion dangers in this area. BRANZ now has an excellent series of information leaflets on materials performance in the geothermal zone.

The article says steel had been used on parts of the Energy Events Centre where aluminium should have been used, and that there had been flow-on effects on the cost of maintaining the building – including replacing the roof after 10 years.

Corrosion has damaged the 'fins' of the façade and the steel structure that holds them to the building. It would have cost $200,000 to repair and replace the metal fins, which are not purely for aesthetics as they help shield the windows from the sun.

Now the whole unit will be simply removed. Councillors were told issues with the build were partly due to historical cost-savings decisions made by previous councils – again, who among us are surprised? Penny wise, pound foolish strikes again!

ACA NZ BRANCH COMMITTEE & OFFICERS 2023

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Education:	Willie Mandeno	ACA Council:	Willie Mandeno, Ry Collier

Email: acanz.mail@gmail.com

ACA NZ PROJECT FEATURES IN 'NZ INFRASTRUCTURE REVIEW'

This quarterly magazine began publication in 2021, and in the latest issue features a 3-page article from ACA looking at corrosion.

See the article online at

https://nz-infrastructure-review.partica.online/nz-infrastructure-review/vol-3-no-3/flipbook/54/

THE COST AND IMPACT OF CORROSION

PUBLIC AND COMMERCIAL INFRASTRUCTURE IS INCREASINGLY VULNERABLE TO THE EFFECTS OF CLIMATE CHANGE, INCLUDING CORROSION OF KEY INFRASTRUCTURE, WHICH COSTS NEW ZEALAND BILLIONS OF DOLLARS EACH YEAR.

PERRY

Image of the first known Christmas card

When corrosion effects are considered in the design stage, structures can be built to be protected and to last longer.