ACA BRANCH — NEW ZEALAND BRANCH

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AUCKLAND 21ST JULY

8.00am - 6.00pm

Waipuna Hotel & Conference Centre, Mt Wellington

Starting from A$85.00

CHRISTCHURCH 24TH JULY

8.00am - 6.00pm

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ACANZ would like to gratefully acknowledge this month's sponsor…

Key factors present in corrosive soils - a refresher

It's almost impossible in most land-based construction projects to avoid interacting with the surrounding soil. Therefore it is important to understand the key factors present in the soil corrosion phenomenon.

Soil corrosion is an electrochemical process whereby complex chemical reactions between the soil and the contacting metal result in the formation of corrosion products and deterioration of the metal. The degree of corrosiveness and the rate of corrosion differ between different soil types.

The key factors that influence the severity and rate of corrosion of soils are:

Aeration. Refers to the amount of air within the voids of the soil particles. A higher degree of aeration lowers the tendency for the formation of corrosion. Well-aerated soils promote higher rates of evaporation and retain less water, thus reducing the amount of electrolyte available for corrosive reactions to take place. For example, sandy soils, due to their relatively large particle size, possess better aeration and allow for quicker drainage and evaporation of moisture than do clay soils.

Moisture content. The drier the soil, the less electrolyte present to facilitate the corrosion process. Soil resistivity is directly related to the moisture content and the levels of soluble salts in the soil. Increasing the moisture content lowers the soil resistivity. Since corrosion is an electrochemical process higher soil resistivity obstructs the corrosion process. Soils with low resistivity have higher conductivity and are deemed more corrosive.

Dissolved salt content. Although the presence of water in soils enables corrosion, the process can be greatly accelerated by the presence of dissolved salts. Dissolved chloride salts in water increase the conductivity of the electrolyte and enhance electrolytic reactions. Generally, soils with chloride (Cl^{-}) and sulphate (S04=) levels below 100–200 ppm are considered to be mildly corrosive.

Soil acidity (pH level). The pH levels of soils vary widely, with values ranging anywhere from 2.5 (acidic) to 10 (alkaline). A neutral pH of 7 in soils is considered to be ideal to minimise the potential for corrosion. Soils with pH values below 5 are considered to be aggressive and can lead to increased corrosion rates and premature pitting corrosion of buried metals. The inherent pH of a given soil can fluctuate due to environmental factors such as rainfall.

Temperature. The soil resistivity is affected by the atmospheric temperature. As the temperature decreases, the resistivity of the soil increases and hence the corrosive potential of the soil decreases. Therefore, corrosion is unlikely to occur in sub-zero temperature environments.

Methods to reduce soil corrosion. These include cathodic protection using sacrificial anodes or an impressed current, and protective coatings. These methods are highly effective and can help avoid costly repairs and replacement of buried metal structures in the long term.

Properly specified stainless steel can provide the longest service when buried underground. Stainless steel is strong compared to plastics and copper, and it is more reliably corrosion resistant than carbon steel. If burying stainless steels then good fabrication practices must be employed. Welds must be pickled and carbon steel contamination must be avoided. Ideally, stainless steel pipelines should be buried in clean sand or fine uniform fill in a self-draining trench that avoids stagnant water. Organic or carbonaceous backfill must always be avoided.

Acknowledgement: www.corrosionpedia.com

MINISTERIAL VISIT TO MEMBER COMPANY

On 4 June'25 the Minister for Small Business and Manufacturing, Chris Penk, braved a very wet and windy Wellington afternoon to visit the Porirua factory of ACA Platinum Corporate Member, Steam and Sand. He was accompanied by members of his staff, and representatives from MBIE and Standards NZ. Also present was Elenora Stepanova, Steam & Sand's PCCP auditor and Executive Officer from CSIRO in Melbourne, and ACANZ members Matt Vercoe and Willie Mandeno.

Steam & Sand's GM, Matt Trail, led a tour of their facilities that included seeing the NZ first custom made WIWA plural component spray for 100 percent VS epoxy intumescent coatings and a demonstration of zinc metal arc spray. This was followed by a demonstration by Director Holly Harding of the unique software she developed (ie BLAST © FoxDog Ltd), to track their jobs using operator and inspector smart phones to produce progress reports, QC records

and invoices. This was of particular interest to MBIE staff and Hon Chris Penk, who is also the Minister for Building & Construction who is introducing changes to the Building Act to allow qualified contractors to self-certify their work.

ACA NZ President visits the SouthMach trade exhibition Christchurch, 27th May 2025

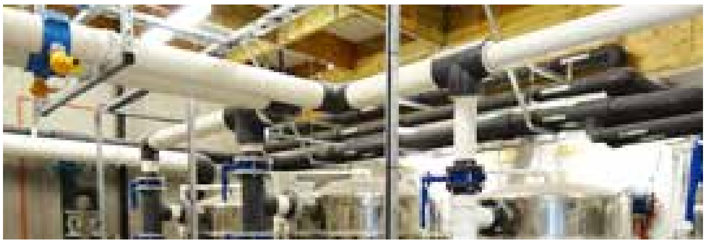
The ACA NZ Branch President Grant Chamberlain recently attended the SouthMach trade exhibition held at the Wolfbrook Arena, Christchurch, on 27th May 2025. The exhibition was very interesting, with lots of high-tech equipment that included some displays of interest to corrosionists. These ranged from the equivalent of the well-known PA10 protective coating in an aerosol can to high-tech compressors.

For people interested in CP there was a firm selling NZ-made specialised electric cables. There was a display of a range of air compressors, abrasive blast hoppers, wheel abraders, and cabinets for the abrasive blasting industry. Grant also attended a seminar talk on preventive maintenance, which discussed a recent Cook Strait Ferry issue.

The wide range of "state-of-the-art" technology was impressive. As they say, you don't know what you don't know.

For students looking for career options, this biennial engineering and machinery exhibition could be inspirational.

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: *How long has Cathodic Protection been employed to control corrosion?*

& A: *200 years!*

The science and practical application of cathodic protection (CP) has a 200-year history and today successfully protects a vast array of infrastructure worldwide from the destructive actions of corrosion.

It all started in 1824 with the initiation of work by Sir Humphrey Davy as President of the Royal Society of London and three extraordinary papers concerning his work, funded by the British Admiralty, on the protection of copper sheeting on ships of war and other ships from corrosion. Davy applied his knowledge, experience, and meticulous scientific method to understanding the cause of the corrosion and reasons why corrosion can be mitigated by electrochemical means.

There had been a historic misunderstanding of the adverse effects concerning the increase of marine fouling on some ships, and consequently insufficient attention given to the precise nature of Davy's research, his recognition of the effect of excessive calcareous deposits upon marine fouling in some circumstances, and his work to rectify the issue. Many of the ships to which Davy's CP was applied returned from journeys free from fouling and always with the copper intact.

Sir Humphrey Davy (1778 – 1829)

Extracted from a recent paper on this subject by a group of ACA Members entitled: "200 years on: Sir Humphrey Davy and cathodic protection".

The authors of the paper are B.Ackland, K.Dylejko, W.Green and M.Buchler.

Corrosion Journal, May 2025, Vol.81, Issue 5, pp 425 - 431.

Report on 95th AEC – CP Technical Group Seminar 2 May 2025

The Australian Electrolysis Committee was formed following the Cathodic Protection Legislation Symposium held 25 May 1977, and held its first meeting at the 1977 ACA conference. It has led a double life ever since, operating also as the ACA CP Technical Group.

The AEC still holds two meetings a year; a full day seminar "meeting" in May or June and a shorter forum at the ACA's annual Corrosion and Prevention Conference.

This year's seminar was held on 2 May at the ACA head office in Melbourne, and online via Zoom. These meetings remain the best forum in Australasia for sharing CP knowledge and experience. This year's meeting was no exception, with a range of interesting topics covered by all the presenters, many followed up with great Q&A's.

One of the most interesting presentations was an update from the APGA Future Fuels CRC by Prof. Mike Tan (Deakin University) on their proposed method for controlling CP, using a corrosion probe that replicates a CP-shielded coating defect, combined with remote control of CP power supplies. This has great promise for the industry - as with most mature pipelines, major coating defects have long been repaired and the severest corrosion is generally now found under disbonded coating, or other insulating material that causes narrow crevices on the pipe-wall (attenuating CP but allowing water ingress).

The shielding monitoring unit alerts the system when corrosion rates increase due to the changes in soil conditions, at which time CP levels can be increased for a period to create a non-corrosive, alkaline electrolyte at the steel surface and maintain it while it diffuses into the crevice. All controlled remotely.

It will also reduce worsening coating disbondment due to very negative CP potentials, by increasing CP levels only when needed. See: https://www.futurefuelscrc.com/project/closed-loop-cp-control-system-for-fuel-networks-rp3-4-02/.

In contrast, Bruce Ackland presented a classic paper, first presented in 1954 by L.T. Ryan – Officer in Charge, Central testing Lab, Dept. of Works, Commonwealth of Australia, entitled Cathodic Protection of Steel-Piled Wharves.

This and the associated discussions showed how much the key knowledge now used for management of CP was discovered in the mid-20th Century. One of the key findings presented in this paper, amongst many others, was, that it is the formation of a calcareous growth with high current in the first few days of application to a marine structure allows the long-term protective CP current to be reduced by an order of magnitude.

Some of the same material is included in Bruce's 2023 paper, on the ACA website here: https://www.corrosion.com.au/using-cathodic-protection-principles-to-understand-the-corrosion-of-galvanic-couples-and-triples-on-artillery-ammunition-dumped-at-sea/

Heavy layer of calcareous deposit and substantial marine growth on a wharf pile. (from the paper by Bruce Ackland on the ACA website. Weblink above).

There were also presentations and discussions on the future of the Victoria Electrolysis Committee following changes to state regulations, the Victoria Branch, electrolysis management in different states, Managing DC stray current interference with computer modelling and others.

Submitted by Mark Sigley, Chair, NZ Electrolysis Committee

VALE: Professor Digby Macdonald

We are saddened by the passing on June 12, 2025 of Professor Digby Macdonald. Digby, who was appointed Professor of Residence in the Departments of Materials Science and Engineering and Nuclear Engineering at University of California, Berkeley in 2012. His appointment at Berkeley was preceded by a Professorship in MSE at the Ohio State University and a Distinguished Professorship in MSE at Pennsylvania State University (PSU).

In addition to his academic career Digby held a number of technical management positions including Director of the Centre for Advanced Materials and Director of the Centre for Electrochemical Science and Technology, as well as Chair of the Metals Program at PSU. From 1984 to 1991 he held consecutive appointments as Laboratory Director of the Chemistry Laboratory and of the Materials Research Laboratory, and Deputy Director of the Physical Sciences Division at SRI International, where he also served as Vice President for two years.

Professor Macdonald was a prolific and productive researcher who consistently made insightful and innovative contributions on a range of topics related to the electrochemical behaviour of metals, ceramics and polymers, especially as regard their use in the generation, transport and storage of energy. Digby was unique in his ability to conduct high quality, insightful experiments and to develop predictive models based on fundamental principles. He was equally at home as an experimentalist and as a theoretician. Of his many hundreds of publications, the ones he most enjoyed preparing were those he co-authored with his wife, Professor Mirna Uquidi-Macdonald.

The value of Professor Macdonald's research has been widely recognised. He has been awarded every prestigious international prize that is available to corrosion scientists. Digby mentored a large number of PhD students and post-docs and his opinions on a wide range of electrochemical issues were always generously provided and greatly valued by his fellow researchers.

While at SRI International, which is located in Menlo Park, and at Berkeley, Digby was always eager to take students and colleagues sailing on the Bay. He attributed his love of sailing to his New Zealand heritage (he was born in NZ) of which he was very proud. Digby studied under Assoc. Prof Graham Wright at Auckland University. Graham Wright was a founding member of the ACA NZ Branch. Digby also attended several ACA Conferences over the years, and was a Plenary Lecturer at the ACA Conference held in Auckland in 2016.

NEW ACA FOUNDATION SCHOLARSHIP SPONSORS ANNOUNCED

We are pleased to announce that Carboline NZ and Metspray have each agreed to sponsor two new ACA Foundation awards. These scholarships will contribute towards the cost of attending the ACA Conference or an ACA training course.

Applications for these and other ACA Foundation awards will be invited in the near future via the ACA Foundation website, https://www.corrosion.com.au/foundation/

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Advertorial

With the cost of coatings today, it is more important than ever to ensure you have the right spraying equipment.

The choice of spraying equipment has a significant impact on both the quality of the coating and the efficiency of the application process. Here are a few key factors to consider when selecting the right spraying equipment:

1. Type of Coating: Different coatings (e.g., paints, primers, stains, specialized coatings) may require specific types of sprayers, such as airless, HVLP (high volume low pressure), or conventional spray guns.
2. Application Area: The size and complexity of the area to be coated can influence your choice. For large surfaces, airless sprayers are often more efficient, while smaller jobs might be suited for handheld HVLP sprayers.
3. Material Viscosity: Thicker coatings may require more powerful sprayers that can handle higher pressure, whereas thinner materials can be sprayed with less powerful equipment.
4. Finish Quality: If a smooth finish is crucial, choosing an HVLP sprayer can help reduce overspray and improve control over the application.
5. User Skill Level: More complicated equipment may require a higher skill level to operate effectively. It's essential to choose equipment that matches the experience level of the operator.
6. Cost Efficiency: Investing in quality equipment can lead to savings in materials and time. Quality sprayers can reduce overspray and waste, making them more cost-effective in the long run.
7. Maintenance: Consider the maintenance requirements of the equipment. Some sprayers may require more frequent cleaning and parts replacement than others.
8. Environmental Considerations: If working in areas with strict environmental regulations, it may be necessary to choose equipment that minimizes VOC (volatile organic compounds) emissions.

Ultimately, the right spraying equipment can optimize the application process, minimize waste, and produce high-quality results, making it a critical consideration for any project involving coatings.

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