

Corrosion

Exclusively



INSIDE:

- Using thermoplastics for structures
- Corrosion consequences on the high seas
- Paint re-cycling initiative
- Specialist contractor lines complex storage tank
- Comparing coating quality through data





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President's Comment

Congratulations to our world class Springbok rugby team with their great win in Japan where they showcased the best that our country can offer. Despite the many socio-economic, governance and related issues we currently experience in South Africa, after the great achievement of our team in Japan I am filled with positive hope for the future wherein we can achieve many great things within a short space of time by working together. Towards this end I express my gratitude towards the previous executive committee, council

and all members of the Corrosion institute for them having put so much efforts in to growing CorrISA and for handing it over to the new council in such a good state.

The last few months before the new council was elected have not been without its challenges with us having lost three members of the executive committee (Armin Schwab resigning to take up a new position outside of SA, the normal departure of the IPP (Edward Livesey) and with the sad loss of the incumbent Honorary Secretary Mboneni Muravha whose passing left us stunned that such a wonderful young man with a bright future could be taken from us so suddenly.) In addition to the above, two more stalwarts on our council (Dustin Botha and Aaron Raath) also left to take up new career positions outside of the RSA. Furthermore, our executive director resigned to pursue building his own business and our bookkeeper left us for a position closer to home.

However, despite these challenges, as the handover to the new council took place an even stronger resolve emerged to advance the aims of the CorrISA and I can assure our members that we will build well upon the foundation that we have inherited. In this regard, I thank our previous president Donovan Slade and his team on which I had the privilege to serve (and learn) for persevering in putting the infrastructure of the Institute in a good and sound financial position as without that base from which to continue the growth the future would not look so bright as it currently does. Positions on the executive committee have been filled and the selection process for the new Executive director has progressed significantly with a selection of an incumbent from the applications received possible within the next few days.

One of my first initiatives has been to engage with academia to ensure that they are in support of the Institute and that we find methods to enlarge the awareness of the importance of addressing corrosion within students at tertiary education institutions.

Another very important initiative will be the holding of a strategic planning session in the new year where the development of a two- and five-year strategic plan for growing the Institute so that it can fulfill its mandate towards its members.

In addition to the above we intend to strengthen ties with our counterparts in other parts of Africa and to engage with our own government to work through ways that will benefit the corrosion industry through the possibility of government resources.

I have often heard anecdotes from our staff about people questioning the value that they get from CorrISA membership, it is my intention to focus on this issue optimising member benefits. Any suggestions from our members as to what you want to see as improved benefits can be emailed through to me directly at president@corrisa.org.za. I eagerly await your suggestions and look forward to engaging with many of you in the new year.

I wish you all a successful end of year and with the Festive season holiday period rapidly approaching us remind you all to take care during this period especially whilst on the roads and at the various places you will spend this time to be safe, rest and "recharge your batteries".

Greg Combrink, President – Corrosion Institute of Southern Africa

OBJECTIVE OF THE MAGAZINE

"The objective of '*Corrosion Exclusively*' is to highlight CORRISA activities, raise and debate corrosion related issues, including circumstances where inappropriate material and/or coatings have been incorrectly specified, or have degraded due to excessive service life. Furthermore, it shall ensure that appropriate materials or coatings, be they metallic or otherwise, get equal exposure opportunity to the selected readers, provided these are appropriate for the specified exposure conditions on hand."



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Cover: Steel must be properly protected regardless of surrounding less corrosive materials.

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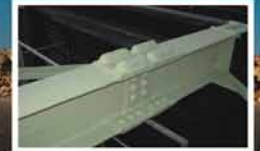
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Editorial Comment

I am extremely grateful for the privilege of continuing my involvement as editor and producer of Corrosion Exclusively as well as other corrosion consulting work since retiring 4 years ago. Added to this is being able to enjoy regular walks with our dogs up the Alphen Trail. On the walk I have encountered uncoated mild steel components that have been out in the open for since the early fifties and although not in pristine condition still look reasonably good despite not being properly coated.



In spite of the seemingly unaffected steelwork in this mildly corrosive condition, there many areas in Cape Town and all along the coast where effective corrosion control is absolutely necessary.

An excellent guide for selection is listed in ISO 12944 – 5: clause 6.4. *(Italics are the editors comments)*



The list includes:

- Determine the corrosivity category of the environment where the project is to be built.
- Establish any special external or internal conditions
- Check tables A2 to A5 for coating systems, pertaining to the corrosion categories *and do remember that coating thickness is essential in aggressive environments.*
- Identify in the table paint or duplex coating systems for the required durability
- Select the optimum one, taking into account the required surface preparation
- Consult a reputable corrosion consultant, paint manufacturer or galvanizer
- *Compile a "Project Corrosion Control Specification" to accompany the above Standard.*

CorrISA continue to invite interested consulting engineers, architects and specifiers to attend our regular technical evenings both in Midrand and Cape Town where interesting corrosion related topics are presented followed up with networking and refreshments.

In this edition we include several articles addressing practical methods of corrosion control, including:

- Using thermoplastics for structures – Part 1 (of 3).
- Corrosion consequences on high seas.
- Protective Coatings Company launches paint re-cycling initiative.
- Specialist contractor makes light work of complex storage tank lining project.
- Comparing coating equality through performance data.

From the KETTLE, a regular contribution on hot dip galvanizing we discuss surface conditions F24 and F28.

Acting Manager of CorrISA, Linda Hinrichen provides an insight into CorrISA affairs.

Graham Duk the Western Cape chairmen gives an account of the Cape Region activities.

We report on CorrISA technical activities in both Gauteng and Cape Region.

Under Education we include NACE educational courses that took place during the latter half of this year.

Many had a fun time at the Annual Awards evening in Gauteng as well as the Gala Dinner in Cape Town where special awards were handed out on the evening.

"SPOTLIGHT" focuses on Ross Mahaffey of C2D Engineering (Pty) Ltd.

Finally, the "RUST Spot" features Neil Webb.

We wish all our members, advertisers and readers a happy, safe and healthy festive season and look forward compiling the next magazine for your reading pleasure.

Terry Smith

Corrosion consequences on the high seas

When pursuing suspected smugglers through the waters off northern Australia or rushing humanitarian aid to a cyclone-ravaged Pacific island, the last thing the Commanding Officer of a naval ship needs to worry about is whether the hull will leak, or a critical system will fail, due to corrosion.

Australia's maritime industry operates in a wide variety of open water and coastal environments ranging from hot, humid tropical to windy, freezing sub-Antarctic. According to international standards, most of these are classified as having very high to extreme corrosion severity containing high levels of salt laden aerosols.

The Royal Australian Navy (RAN) has all its water borne assets and most support infrastructure exposed to these environments. For the RAN, corrosion has consequences in addition to the economic ones faced by other organisations.

The RAN consists of approximately 50 warships including frigates, destroyers, amphibious landing ships, submarines and patrol boats. It also operates minehunters, resupply vessels and hydrographic survey ships. In addition to its vessels, the RAN's rotary wing aircraft are integral to its operations. Generally, warships can tolerate higher levels of corrosion causing structural damage than aircraft.

All of the RAN's vessels, equipment and structures must be protected to minimise the impact of corrosion. Traditionally, naval maintenance was carried out on fixed-time schedules such as the rolling hull survey of RAN frigates. Such programs do not allow for the impact of the actual operating environment encountered by individual vessels and its impact on operational availability.

However, when an asset is managed effectively, the impact of corrosion can be minimised. According to a DoD spokesperson, the RAN has implemented a "whole of life" management plan for its

assets as recommended by government reviews carried out in 2008 and 2011. "The plans factor the overall costs for maintenance into the acquisition process," the spokesperson said. "A culture of accountability has also been instituted which considers the risk-versus-cost benefits of deferring preventative maintenance."

There are a number of ways to estimate the financial cost of corrosion of RAN assets, including scaling the costs of a foreign navy operating similar warships. According to the RAN spokesperson, the economic impact of corrosion and its degradation of naval assets and infrastructure is estimated to be between \$135M and \$650M annually, depending on the metric used to calculate the cost of maintenance and remedial repairs.

The planning now being implemented by the RAN is condition-based maintenance which optimises maintenance costs by only intervening when a monitored system's condition indicates a problem. Corrosion Prognostic Health Management (CPHM) uses these principles to predict current and future



Adelaide class guided missile frigates (FFG), HMAS Newcastle (06) in N42 Storm Grey Polyurethane and HMAS Melbourne (05) in RAN Haze Grey Polysiloxane.

corrosion conditions based on platform usage in an operational environment. CPHM uses a combination of sensors and models to predict and plan future maintenance activities and operations.

"Moving from a time-based to a condition-based maintenance system through use of

environmental and corrosion sensors, allied with corrosion prognostics and modelling, should allow targeted maintenance and more efficient use of limited resources," the RAN spokesperson added. "It will also allow improved scheduling of maintenance, resulting in optimum usage of platforms and equipment."

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Defence researchers assess the corrosion and anti-biofouling performance of test hydraulic units coated with HVOF coatings at the DST marine exposure site in Melbourne, Australia.

Ship staff on a warship are directed to report changes in appearance or obvious signs of corrosion. If staff have the relevant training they may apply corrective maintenance if it is safe and timely to do so. However, maintenance at sea or on operations is usually only carried out if it is high priority. The majority of maintenance is carried out while the ship is alongside or in dry-dock in accordance with the technical maintenance plan.

The RAN's mission includes maintaining Australia's sea lines of communication and defending Australia's sovereign interests. Additionally, it undertakes humanitarian missions around Australia and the Asia Pacific region. From a long term perspective, corrosion shortens the "life of type" of vessels that can create a capability gap as it may

be several years before replacement vessels come into service and may have a large impact on the ongoing maintenance budget as the older vessels are kept for a longer time than planned.

It is important to manage corrosion in the defence industry using preventative measures over both short and long timescales. Unidentified or untreated corrosion issues can lead to unplanned corrective maintenance that can affect availability, readiness, safety and capability of RAN vessels and rotary wing aircraft for operations, all of which result in significant costs.

Protective coatings are critical to mitigating corrosion as they form the barrier between the metal and the aggressive marine

environment. The RAN spokesperson stated that a paint specification document that details the coatings systems to be applied to every part of the ship, from underwater hulls, superstructure and decks to all internal areas, is prepared for each vessel prior to construction.

Safety-of-flight is paramount for the RAN's air assets—this demands very strict inspection and maintenance programs to mitigate risk of failure. Failure of a key component in flight could result in accidents leading to loss of the helicopter and loss of life.

Areas of naval vessels subject to continuous water immersion, such as the underwater hull, bilges and tanks, are considered critical as these areas are more prone to coating failures and corrosion. Corrosion and loss of metal in tankage is a major factor in determining the life of commercial vessels. Freeboard areas, which are subject to continuous water spray while underway, and ship decks are also considered critical.

Research in to the development of specialised protective coatings for military applications is supported by the Australasian Corrosion Association (ACA). The organisation works with private companies, not-for-profit bodies and academia to research all aspects of corrosion prevention and mitigations. The ACA provides an extensive knowledge base that supports best practice in corrosion management, thus ensuring all impacts of corrosion are responsibly managed, the environment is protected, public safety enhanced and economies improved.

Several ACA members are currently engaged in a range of Defence related projects. The Chair in Electromaterials and Corrosion Sciences at Deakin University, Professor Maria Forsyth, and Senior Research Fellows, Dr Katerina Lepkova and Dr Laura Machuca Suarez, at Curtin University's Western Australian School of Mines: Minerals, Energy and Chemical Engineering are investigating anti-corrosives such as lanthanide-based ones to mitigate microbially induced corrosion and special anti-corrosive pigments.

A related anti-corrosive pigment project is being undertaken by researchers Dr Sam Yang and Dr Tony Hughes at the CSIRO's



Marine hydraulics using the newly developed HVOF coatings are more resistant to biofouling and are more readily cleaned without damage to the anti-corrosive coating.

Materials Science and Engineering division, specifically looking at ways to transport these pigments to defect sites.

Swinburne University's Associate Professor Scott Wade from the Faculty of Science, Engineering and Technology, is researching microbiologically influenced corrosion of piping materials and mitigation options, and high velocity oxygen fuelled (HVOF) coatings for marine hydraulic applications.

For many decades, the RAN employed solvent-based gloss alkyds as the topside coating for vessels but these were not very durable, often failing in as few as six months. In the 1990s, a polyurethane coating was introduced but this has since been replaced by a Low Solar Absorbing (LSA) Polysiloxane coating which has a colour-stable pigment which provides improved visible camouflage in the waters around northern Australia. The polysiloxane also has improved thermal protection reducing the cost of cooling ships, where trials of patrol boats in northern Australian waters showed that the surface temperature of the polysiloxane coating could be as much as 15°C cooler than traditional coatings.

The development of rapid-cure, ultra-high solids, two-pack epoxy amine coatings technology offers potential advantages for the RAN, especially when dealing with complex internal surface geometries found inside sea water ballast tanks which feature baffles with cut outs between bays and numerous longitudinal and transverse stiffeners to provide requisite rigidity and strength. Historically, corrosion on these edges would appear after a period in service, largely as a result of the poor edge retention of conventional coatings that were used.

The latest epoxy amine coatings are applied using specialised plural component high pressure spray equipment where the two components are mixed at, or close to, the tip of the spray gun and generally require each component to be pre-heated to reduce flow viscosity. The coatings can be spray applied at high film build without sagging, have improved edge retention and produce very low emissions of volatile organic compounds. These coatings cure very quickly and can be walked on within a few hours, promising a fast return to service.

The specification of high performance coatings for RAN ships must be supported by rigorous quality assurance inspections. It is imperative that coatings are applied as per specification or manufacturer's recommendations, which is best achieved through the use of independent inspectors who are required to witness the condition of the substrate and undertake measurements, such as dry film thickness at key 'hold points', during the surface preparation and painting processes to ensure that the environmental conditions are suitable for painting. These include weather conditions, substrate temperatures, and dew point.

Other corrosion management technologies applicable to naval vessels and infrastructure includes research into anti-corrosive coatings, for superstructure, underwater hull, tanks and bilges as well as cathodic protection of hulls, bilges, ballast tanks, seawater piping systems.

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Protective coatings company launches recycled paint initiative

Global protective paints and coatings manufacturer AkzoNobel (Amsterdam, The Netherlands) has become the first major manufacturer to launch recycled paint as part of a U.K. partnership with resource management company Veolia (Aubervilliers, France).

Developed by the company's Dulux Trade brand, the Evolve matt emulsion is made from the waste of paint tins in a bid to reduce the amount that goes to landfills.

Once any white paint has been reclaimed, it is sorted, filtered, and refined by Veolia. It is then re-engineered with new paint by AkzoNobel and tested extensively to ensure that every tin meets the requisite standards. The final product contains 35% recycled paint.



Image courtesy of AkzoNobel

"We're always looking for new ways to drive sustainable innovation, cut down on waste, and create a circular economy for paint – while offering our customers fresh solutions that don't compromise on quality," says Ruud Joosten, chief operating officer. "By introducing Evolve, we will reduce the carbon footprint of our Dulux Trade

products, and help our customers reach their own sustainability goals."

"Sustainability is at the heart of our business," adds Rinske van Heiningen, director of sustainability. "That's why we focus on developing products and technologies with the biggest positive impact. We're also well aware that people expect more than just a product from a brand, so we're always striving to deliver the most sustainable and meaningful solutions."

Evolve was created after years of investment and commitment, according to the manufacturer. A particular achievement cited by company officials was reducing the carbon footprint of each liter of Evolve paint produced by more than 10%, as compared with standard vinyl matt.

The product underwent rigorous testing by research and development experts and was blind tested by decorators and painting contractors. A number of small-scale trials were also conducted.

"The launch of this new paint is just the latest step on a journey AkzoNobel is taking towards meeting its sustainability targets and helping to close the loop on paint waste," Joosten says.

Initially available in white only, Evolve was first launched in late October.

Source: AkzoNobel, www.duluxtrade.co.uk/evolve.

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Using thermoplastics for infrastructure protection in marine and other challenging environments

Prepared by A&E Communications & Technical Department for Australasian Corrosion Association (ACA)

Presented by Sean Ong (General Manager, Asia) at Corrosion & Preventions 2017 Conference, Sydney, Australia

PART 1 (OF 3)

Summary

Corrosion Inhibiting Thermoplastics offer the ability to deal with a multitude of corrosion problems on whole assemblies with just a single application and minimum surface preparation. This would obviously be of enormous benefit to owners and operators, particularly in the mining and offshore industries where cost-effective remedies can be hard to find, but can such a claim be justified? This paper examines the mechanisms that provide the protection, how the material is used and what the past fifteen years of experience applying the material in a wide range of different environments can tell us about its efficacy, longevity and potential for the future.

Keywords: Thermoplastics, Corrosion, Infrastructure, Marine, Mining, Offshore

Introduction

Steel structures in coastal and offshore environments are characterized by high levels of corrosion and the need for constant vigilance in order to maintain function and prevent failure of containment and/or delivery systems. Environmental and safety considerations also demand effective long-term remedies where structural integrity may be at risk. In the UK, safety authorities have identified corrosion prevention on North Sea



Figure 1: Rusty valve deck on offshore infrastructure.

structures as a key area requiring improved performance from operators.

Solutions include prevention through the use of design, material selection and advanced coating systems yet, despite everything, rust abounds.

Figure 2 shows corrosion in galvanized PTFE bolts after only 18 months exposure a splash zone environment in long-term DNV testing.

In the most intractable areas, galvanic and pitting corrosion may be visible within

months– and service-life extensions mean that even the best-maintained structures will have corrosion problems in areas which are difficult to resolve.

Figure 3 shows well heads from an unmanned platform in the North Sea. Many platforms in the North Sea and elsewhere were constructed with an expected service life of a maximum thirty years but, in 2010 when these photographs were taken, they were already ten years past their sell by date and becoming unfit for purpose.



Figure 2: Rusting bolt from DNV testing.



Figure 3: Ageing infrastructure in the North Sea.

In some cases, infrastructure was replaced where metal loss threatened integrity but, with only a few years left of production in a stagnant market, wholesale renewal of such costly facilities could not be justified and operators wanted to find a safe and effective remedy for their problems. Accordingly, in 2010, a trial application was requested

from a UK company offering a sprayable thermoplastic anti-corrosion system and a series of extremely corroded wellheads were protected using the system. At the time, the company applying the system indicated to the customer that it would stop the existing corrosion and prevent any further corrosion for at least 10 years.

As often happens in these cases, personnel and budget priorities changed and, despite the success of the initial application, the operators didn't follow through and it wasn't until 2016 that an inspector, who happened to be going to the platform decided to inspect the well heads to see what had happened. His report showed that everything the company had promised about the levels of protection had been true. Of the sample substrates from which the removed material he concluded:

"...the 2010 application... has arrested the corrosion of the flanges. The encapsulation properties of the product have performed as expected in preventing moisture ingress and further corrosion."

Before going any further, we should look at the system and how it works.

How the system works

Thermoplastics have a long track record of corrosion and impact protection through their use as dipping agents for precision parts and machined tools in workshop or factory environments, as shown in Figure 5. More recently, advances in delivery systems



Figure 4: Remedial application to North Sea Wellhead.



Figure 5: Thermoplastic dipping.



Figure 6: Application units.



Figure 7: Stages of the system.

and material development have produced durable, UV-resistant coatings with enhanced anti-corrosion properties that can be spray applied on to any substrate, in any location.

Corrosion-inhibiting sprayable thermoplastics (CIST) as the new materials are known, coupled with the equipment we have seen, claim a number of advantages over traditional coating systems:

- Adaptability – a 'one size fits all' strategy means the same material and equipment can be used on the smallest component as well as a large complex assembly
- Portability – the equipment is mobile and can be taken to site where it can be easily moved around and has the ability to deliver material up to 19 metres away from the application unit using hoses and spray guns
- Easy to prepare – the material requires very little preparation – once loose surface materials are removed, the material can be directly applied to rusty surfaces
- Active protection – the material contains corrosion-inhibiting oils which are circulated on to the substrate throughout the lifetime of the application, arresting existing corrosion and preventing any further deterioration
- Passive protection – the application forms an impermeable close-fitting barrier to ingress of moisture and contaminants
- Highly resistant to UV and salty, wet marine environments
- Low environmental impact – re-usable, recyclable and non-toxic, the system is non-hazardous and can be virtually waste free.
- Can be applied to complete assemblies – no need to separate parts or shut down plant

The system works by combining a small percentage of inhibiting oil into a UV-resistant polymer and creating a resilient hard rubbery thermoplastic that is solid at ambient temperatures.

The material is chipped for easy handling and fast melting. It is entered into the heating tank of specially designed application units,

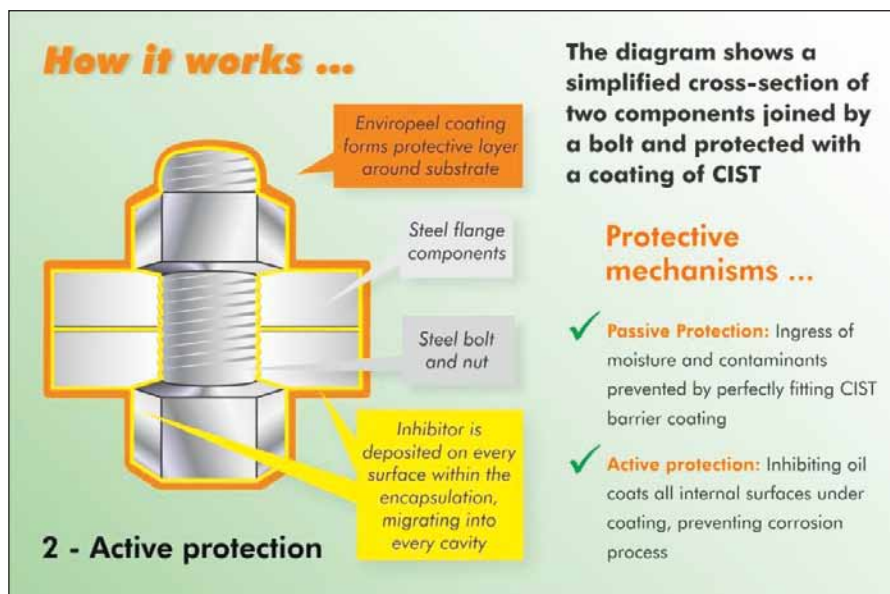


Figure 8: Protective mechanisms.

where it is heated to form a liquid which is then delivered on demand through heated hoses to the spray gun which applies the material to the substrate. Rapid cooling of the material causes the application to tighten around the substrate to form a close-fitting cocoon. The protection mechanisms of the material are represented in Figure 8.

The outer barrier prevents ingress of moisture and oxygen while, internally, inhibiting oils volatilized by the heating process are released on to all surfaces inside the encapsulation. Minute quantities of oil within the material continue to circulate on to the steel surface for as long as the material remains in place.

The combination of ingress prevention, excluding moisture and oxygen, and prevention of the galvanic process through an active oil coating means the system is effective in providing both remedial and pro-active corrosion prevention to complete assemblies such as standby equipment, valves and flanges as well as small components or substrates.

So, this is the theory, how does the product actually perform? Four frequently asked questions are:

1. How does the product perform in marine and high UV environments?
2. How long will it last?
3. How long before the inhibitor runs out?
4. How impervious to water is the material?

The Editor would like to thank ACA for Part 1 of this contribution.

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Comparing coating equality through performance data

By Kevin Morris, Market Segment Director, Water & Wastewater, for Sherwin-Williams Protective & Marine Coatings, Cleveland, Ohio, USA

Selecting the optimal coating system for a given application can make you the hero on a project, while choosing an inferior product can lead to reduced efficiencies, lower performance, and higher lifecycle costs. Whether a specifier, contractor, or asset owner, careful and informed coatings selections are imperative. Unfortunately, the selection process may be tougher than expected. It is possible to predict the application environment and conditions within reason and to rely on experience; however, comparing products may be confusing.

Consider ASTM International's testing methods. Some tests and data points offer reasonably accurate comparisons for certain products in certain applications. However, ASTM does not intend for its tests to provide numerical comparisons of stand-alone data. Direct product performance comparisons should be made only when testing similar systems at the same time, in the same lab, using the same technician. Making correlations without a controlled, side-by-side test creates the potential for invalid conclusions about the most suitable coating for a project. While ASTM tests that provide repeatable, reproducible determinations can be highly relevant to the coating selection process, irrelevant test data can

create confusion and may lead to product selections based on incorrect assumptions. The trick for specifiers, contractors, and owners is to understand which tests are most relevant.

Understanding repeatability, reproducibility, and acceptable variances

Numerous coating-related ASTM standards can help in evaluating physical and chemical characteristics to make sound product selections. Their relevance relates primarily to the repeatability and reproducibility of each testing method and the resulting acceptable levels of variance. Mechanical tests, such as those using pneumatic testing devices, have lower acceptable levels of variance, while tests relying on human factors, such as manual adhesion tests, have higher acceptable variances due to their subjective nature.

The repeatability of a test method measures the maximum difference calculated among multiple tests that are run on the same piece of equipment in the same lab. The reproducibility of a test method measures the maximum difference calculated among multiple tests that are run in different labs.

In either scenario, the labs involved should perform round-robin testing to capture multiple values; and averages, using the greater and lesser results, should be used to determine an allowable variance. Actual application results are expected to fall somewhere within a product's determined variance.

Intra-lab repeatability results are typically very accurate, as the conditions and test operators are the same. However, inter-lab reproducibility results can be suspect due to lab variances. For example, a coatings manufacturer's lab could have greater accreditation than a third-party lab. Therefore, the third-party lab's results – while unbiased – may not be as accurate as expected when comparing them to results from other labs. A direct comparison of two or more products tested in the same lab under identical conditions will provide useful, comparative data to help with product selections.

Detecting nonrelevant data

Even with credible testing available, product specifiers should be wary of the best testing result achieved from any lab rather than an average of multiple test results. This



Specifiers, contractors, and owners should thoroughly understand the coating tests.



Salt fog test - sample panel.

Photo courtesy of The Sherwin-Williams Co.

artificially inflated rating could lead to selecting a less-than-optimal product.

Unfortunately, any shortcomings related to inaccurate data may not be evident, as the final coating application may look great. However, any deficiencies will be evident when a compliance engineer evaluates the coating system's physical properties against the specification. If the classification of the application is determined to be noncompliant, who is at fault? The contractor isn't to blame because the specified product was used. The specifier is off the hook because the selection was based on published data. The manufacturer could be absolved based on the allowable variances for published data. Ultimately, the application may be noncompliant per the specification with no one to blame.

Another misleading practice is publishing data based on exorbitant hours of testing. For example, if 50 000-h of ASTM B117 salt fog testing is done on one product and a competitive product has been tested for only 5 000-h, is the 10-fold factor any more relevant? The competitive product may perform just as well, but it simply hasn't undergone the longer testing. The inflated 50 000-h testing mark may prevent a broader selection of products if the specifier publishes this data point as a requirement. Doing so may limit the choice to a sole product, which may not be in the best interest of the project.

Identifying misleading tests

While most tests provide reasonable, reproducible determinations, some hold little relevance for selecting products and others are highly subjective. In addition, coatings may not perform in real life as they did in a controlled environment. Specifiers, contractors, and owners should thoroughly understand the tests.

Salt fog test

This sample panel underwent the ASTM D5894 cyclic corrosion weathering test. Users can expect the coating to perform similar to this test panel when applied to a steel substrate.

The ASTM B117 standard, which measures corrosion potential by subjecting coated samples to a salt spray (fog) test environment, may not correlate with

real-world performance. ASTM B117 states, "Prediction of performance in natural environments has seldom been correlated with salt spray results when used as standalone data."¹ Therefore, the test may not predict a coating's performance accurately. For example, specifiers should be especially wary when presented with ASTM B117 data for product selection with an application where salt fog would never be present in the environment (i.e., a drinking water storage tank).

A more representative test is the ASTM D5894² cyclic corrosion weathering test, which uses a modified salt fog test chamber similar to ASTM B117 in conjunction with a separate fluorescent ultraviolet/condensation cabinet. The ASTM D5894 test attempts to emulate real-world conditions by alternating between wet and dry, and dark and light exposure conditions, as opposed to a constant salt fog atmosphere. Yet even with its more realistic testing protocols, the ASTM D5894 standard says, "No single exposure test can be specified as a complete simulation of actual use

conditions in outdoor environments."² In other words, there is no ideal substitute for real-world application testing.

Adhesion

The ASTM D4541³ test determines the pull-off strength – or adhesion – of a coating from a metal substrate and provides a value for the "perpendicular force... a surface area can bear before a plug of material is detached."³ However, results can vary when using different substrates. For example, the adhesion rating will likely be lower on a 1/8-in (3mm) steel plate compared to a 1/2-in (13mm) plate because the thinner steel may deform and contribute to the plug peeling off. In addition, the test may be subject to manipulation, as a product can perform differently depending on the rate at which the manually controlled testing wheel is turned and how steadily the device is held.

Compressive strength

The ASTM D695⁴ test typically involves casting a 2-in (51mm) cube of a coating material and determining how much force can be applied before it is crushed.





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However, the result may not correlate with a real-world application of the coating applied at a normal thickness. Consider a specification for a high-strength floor coating applied at 125 mils (3mm) with a compressive strength of 124 MPa (18 000 psi). A tested rating of 124 MPa on a 2-in thick sample will not transfer to the coating applied at only 125 mils. In addition, when the coating is applied to a concrete substrate, which only has a compressive strength of ~28 to 34 MPa (4 000 to 5 000 psi), the concrete theoretically will be crushed sooner than the coating. To keep it from cracking under higher pressures, the coating must have sufficient elongation properties so it can bridge cracks that will form in the substrate. Therefore, this specification would be better stated in this example as requiring a product with sufficient elongation properties and a compressive strength that is at least above the concrete substrate's maximum strength.

Abrasion resistance

The ASTM D4060⁵ test evaluates a coating's abrasion resistance using an automated Taber[†] abraser to scuff the surface of a rigid coated surface. The reproducibility and repeatability of this test is highly subjective, as results can vary by as much as 95% between labs and even up to 45% within the same lab. The primary culprit for this variability, per the standard,⁵ is "due to changes in the abrasive characteristics of the wheel during testing." In addition, the smoothness of the finish can cause varied

results. Coatings with greater textures may demonstrate higher abrasion potential simply because the abraser will grind off the coating's peaks before reaching a smoother area. Even if the smooth area of the coating has low abrasion potential, the loss of the original peaks will suggest a lower overall abrasion resistance.

Determining optimal product selections

Given the subjectivity of certain tests and the potential for receiving nonrelevant or misleading data, how can specifiers, contractors, and owners make sound product selections for specifications and applications? Here are a few tips:

- Use industry standards that feature pass/fail criteria. While ASTM tests provide reasonable, reproducible determinations, they don't provide pass/fail criteria, so there's no benchmark to meet. Look to tests like SSPC Paint 36,⁶ which provides various levels of pass/fail criteria based on multiple test methods agreed upon by industry peers.
- Rely on relevant side-by-side testing. For reliable product comparisons, make sure the products are tested in the same manner at the same time in the same lab and with the same technician. Doing so ensures objectivity and standardization. Also, ensure the tests are relevant to the application and that they are run in a round-robin series to determine a rate of repeatability and reproducibility.
- Review verifiable case histories. Some products that perform the worst in accelerated testing environments actually work the best in real applications – and vice versa. There is no substitute for real-world performance, so look to application case histories, preferably ones similar to the given application, to verify product performance.

- Avoid sole-source specifications. Whether explicitly or by default because no other product can meet the published requirements, specifications listing a single product can artificially inflate job costs with no extended service life benefit. Specifiers should consider expanding the specification. Contractors should push for viable alternatives that can make bids more competitive or enhance the project's lifecycle.
- Get the full story. Question the relevance and accuracy of data points, and ask product manufacturers to explain why the data are important for the application.

Following these tips can help improve the validity and relevance of specification requirements and lead to optimal coating system selections, which ensures asset owners can realize long service lives and minimal lifecycle costs for their coatings.

This article was originally published in Materials Performance. Reprinted with permission from NACE International.

[†]Trade name.

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About the author

Kevin Morris is market segment director, water & wastewater, for Sherwin-Williams Protective & Marine Coatings, Cleveland, Ohio, USA (email: Kevin.L.Morris@sherwin.com). He has been in the protective and marine water and wastewater industry for the past 16 years and with The Sherwin-Williams Co. for 26 years. Morris is a NACE International-certified Level 3 Coating Inspector, an SSPC-certified Concrete Coatings Inspector, and an instructor for the Concrete Coatings Basics and Concrete Coatings Inspector programs with SSPC. He has published numerous papers and articles for a variety of industry organizations.

Specialist contractor makes light work of complex storage tank lining project

BKV Holdings completed the lining of six newly-built phosphoric acid-storage tanks in record time to enable Bidvest Tank Terminals to receive already-confirmed shipments of Phosphoric acid at its state-of-the-art tank terminal in Richards Bay, KwaZulu-Natal.

The company mobilised to site in April 2018 shortly after the principal contractor, Trotech Engineering, had completed the construction of the storage tanks as part of a large capital expansion programme at the cutting-edge facility.

Notably, BKV Holdings completed the lining of more than 8 300m² of surface area in only seven months – well ahead of the initial completion date – and within budget.

Jan Botha, the company's Site Manager, attributes yet another successful BKV Holdings' project to a firm commitment to quality that already starts in the very early planning phases to mitigate errors and the risk of having to redo work.

"We had to line at least one tank of up to 12m in height and 20m in diameter every month to ensure the timely completion of the project. Accuracy was, therefore, an imperative right from the early preparatory phases, which included the onerous task of erecting up to 30 tonnes of scaffolding inside a single structure so that our team could access the work faces," Botha says.

An impressive 80 tonnes of Kwikstage scaffolding was erected and dismantled for this project, a task that was also greatly facilitated by accurate designs from Form-Scaff, a leading South African formwork supplier. They were further refined and optimised by BKV Holdings before mobilising to site, while the erection of the scaffolding was supervised by the highly competent Sipho Mazibuko, one of BKV Holdings' many seasoned accredited scaffolding inspectors.

Mazibuko was joined on site by BKV Holdings Quality Control Inspector,



Gladmore Maramba, as well as supervisors, Zibekile Ronoti, Bongani Mathonsi and Admire Nyamukapa.

One of the complexities was installing the tonnes of scaffolding in an extremely confined area, while the many sections had to be passed manually through a narrow 800mm-diameter manhole located just above the concrete column bases.

Extraction fans were then installed at the manhole and at the top of the storage tanks to enable the large team, sometimes comprising as many as 18 employees, to work in the restricted areas. At times, they would also have to share the limited space with and coordinate their operations around the main contracting teams that were finalising "snag items" inside the tanks.

Botha says that meetings were held almost on a daily basis between the company's own employees, as well as with other representatives of the professional team to pre-empt any problems and proactively implement solutions to keep the project on track.

The state-of-the-art tank-lining solution deployed at Bidvest Tank Terminals was similar to the one that BKV Holdings designed and implemented for a leading

fertiliser producer. Considering the excellent service it received from the contractor, the client recommended BKV Holdings' sophisticated corrosion-protection capabilities to Bidvest Tank Terminals.

The entire area was first abrasive blasted with mineral slag grit to a NACE1/SSPC-SP5/ISO SA3 specification and, in so doing, providing a surface-anchor profile of between 50µm - 75µm to aid the lining in the bonding to the surface.

"We then applied a 90:1 National Urethane Industries (NUI) salt-less neutralization wash at high pressure to the surface. This neutralised any soluble salts and oil-based contamination according to the NACE International SP1 specification. Using Wattman papers, tests were undertaken according to ISO 8502-12 standards to ensure that soluble salt levels were below 25mg/m². This was complemented by a water-break free test to confirm that there were no soluble contaminants on the surface," Botha says.

Notably, more than 42 tonnes of grit had to be transported all the way from Rustenburg specifically for this project and the spent grit manually removed through the narrow manhole and disposed of according to a strict health, safety and environmental plan.

This strategy made contingencies for the correct handling and marking of designated skips, including those used to contain hazardous and flammable substances, through to the appropriate management of the restricted dedicated bunded area. The company and the client also jointly devised and approved a comprehensive strategy to respond to any potential major spills and incidents.

Botha says that all of the welds were then stripe coated with NUI Ultraspray 400B199 Rigid Polyurethane lining system to a thickness of 1500µ.

He says, "It was applied at an optimal spraying pressure of 2000psi at 45°C using a plural component high-pressure proportioning unit with an impingement mixer at the front of the application gun to heat and mix the two parts together. A final coat of Ultraspray 400B199 Rigid Polyurethane lining system was then applied in the same manner as the first coat."

The linings were thoroughly inspected for defects, such as pinholes, blisters, streaking or bulging, run, as well as overspray on any of the fixed equipment, and repairs instituted wherever necessary.

Notably, all of the company's work was successfully signed off by Avax Projects' Karyn Albrecht, an independent NACE International coating inspector, on behalf of the client.

Based on the company's impressive performance lining the tanks, Bidvest Tank Terminals also extended BKV Holdings' contract to include the lining of a sump and bunded area, as well as to apply base protection on all six tanks in October 2018. A portion of the existing resources available on site was swiftly mobilised to this component of the work scope.

Certainly, one of the company's competitive edges is its extensive in-house resources, including the comprehensive range

of equipment that it uses on all of its projects. BKV Holdings used two 1000cfm compressors; six 200l blasting pots; a 10000l diesel bowser and water bowser; a 15 tonne and 30 tonne crane; and three plural component-lining machines on this particular project.

They were complemented by the company's own sophisticated weather-measuring technology. It was used in conjunction with the client's weather station, as well as internet forecasts that were updated on a daily basis.

These were critical considering that this specific application cannot be undertaken during rain or inclement weather and when temperatures are below five degrees Celsius or above 40°C.

Meanwhile, BKV Holdings also had to pay close attention to dew point temperatures which, when within three degrees Celsius of the substrate temperature, result in the formation of condensation on the application area.

Despite having to stop work for 12 days due to heavy rains and extreme humidity inside the tanks, BKV Holdings still completed the project ahead of schedule.

Notably, there was also not a single safety incident on the site throughout the about 38500 man hours the company's spent working on this project, even though as much as 80% of the work was conducted at heights.

However, Brett Vermeulen, Managing Director of BKV Holdings, attributes most of the company's ongoing success to his strong and dedicated team.

"Our strength remains the extensive skills and depth of experience housed within the company. They have ensured that we maintain our strategic competitive edge as the foremost supplier of sophisticated corrosion-protection and lining systems to leading industrial companies, such as Bidvest Tank Terminals," Vermeulen concludes.



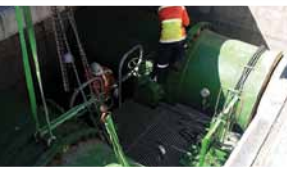
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In September 2019, EnerMech was selected to provide integrated engineering services to the Lesotho Highland Water Project in Clarens. Our Industrial Services Division was responsible for tunnel mechanical cleaning, concrete repairs and corrosion protection scopes, and the Valves Division was responsible for the complete removal, refurbishment, installation and commission of valves ranging from DN250 to DN1600, inclusive of all crane operations and rigging. A full turnkey solution was required timeously delivered by EnerMech, within the critical project deadlines.

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CORROSION *Titbits*

By Lungile Harya, Corrosion Lab



Corrosion monitoring coupons

Lungile Harya is an up and coming corrosion specialist with a background in physical, or what is otherwise known in some circles, engineering metallurgy. During her undergraduate years at the University of Johannesburg she developed a keen interest in corrosion which all commenced with her designing a poster on an electrochemical cell wherein she demonstrated that a current will flow and light up an LED when all the elements of the electrochemical cell were present. She is currently enrolled for her B Tech (Engineering Metallurgy) at UJ and is expected to complete it this year. During her studies in 2015 she commenced working part-time as a Corrosion Technician at Total Contamination Control SA performing general corrosion related testing whenever a suitable project came in but more recently and in a full-time position, she has gravitated towards specializing more in the fascinating field of corrosion inhibitors. This column is her first journalistic contribution to the corrosion fighting world and I, having had the pleasure of being the first person to read this very first column, am sure that we will see many more of her Corrosion Titbits and can say with confidence that I for one will be a regular follower. I wish her a successful and long relationship with Corrosion Exclusively.

Greg Combrink

Exposing sample corrosion coupons can be a cost effective method of selecting a new material or coating system for use in a new application which is to be subjected to a given environment, corrosive liquid or material.

Although less likely, the method could also be used where an existing machine or piece of equipment is starting to show signs of premature internal or external corrosion. The method lends itself well to design applications, where material-environment interactions can be simulated at a reasonably low cost and the parameters to prevent corrosion can be determined. However, it is not a miracle method – a technically skilled person will need to consider several factors before starting any coupon experiments.

Where the experiment is placed is a good example of a consideration that could impact the results? Lab coupon experiments have the advantage of a perfectly controlled environment, where all the details are known and can be changed as necessary to create a dynamic experiment. Possible downside are the expensive consumables and challenges getting the simulation to resemble the real environment, where trace elements can be misrepresented.

In-situ experiments have the opposite advantages - the environment is natural, with possible fluctuations in humidity and trace elements. One disadvantage, however,

is correct placement of the coupon, which is of paramount importance. Another disadvantage is the difficulty in monitoring of the coupons from a distance. For instance, if the experiment is unwittingly changed it may take a while before the error is grasped and corrected, if at all. Mitigating these disadvantages can be expensive but would be worthwhile.

An important factor that must be taken into consideration is the orientation of the coupons – diagonal, horizontal or vertical. Ideally, each orientation should be practically represented in the experiment and the effect compared. Orientation affects time of wetness which together with residual mineral and dust deposits can considerably affect the corrosion rate of the coupon.

A further consideration is the pilferage of the coupons leading to possible inaccurate extrapolation or failure of the experiment.

All things considered, coupons are a cost-effective way to approximate and monitor corrosion in a set environment. The limitations of exactness are well balanced by the simple equipment needed to set up the experiment at a low cost. Whatever the experiment design, the goal is to be able to determine material performance in an environment and recommend its suitability for use. Skill, however, is needed to set up the coupons and to analyze the results and this forms the bulk of the cost.

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From the KETTLE

The role specifiers and end-users have in selecting a corrosion control coating, suggests that all aspects of a hot dip galvanized coating be highlighted and if necessarily de-mystified. The intension of this series of surface conditions is to ensure that the customer or specifier has a greater understanding of the coating so that it is not necessarily rejected or accepted for the wrong reasons, resulting in wasted time for all personnel. See F24 and F28.

Legend

A Accept **R** Reject **REP** Repair

F24

DESCRIPTION:

Appropriate coating repair on site by zinc thermal spray (ZTS) or zinc metal spraying (ZMS).

CAUSE:

When modular components have been delivered to site and must be welded or alterations or additions are required, coating repairs are necessary, SANS 121 allows for these repairs. Zinc thermal or metal spraying is preferable to a zinc rich paint or epoxy due to the long term sacrificial properties afforded by the former and also for reasons of long term colour matching and easily achievable required coating thickness.

EFFECT / REMEDY:

SANS121:2011 (ISO 1461:2009) requires a coating repair using zinc thermal or metal spraying of 100µm minimum thickness. When coating repairs are done on very thick hot dip galvanizing >150µm the edge of the repair must be ground slightly before application of the repair material. Also when duplex coating, the coating thickness of the repaired surface must be equal to the surrounding zinc coating thickness. The applicator must remove excess ZTS by stainless steel brush. Individual areas no greater than 10cm² or a total surface area of 0.5% on a single component, may be repaired. See HDGASA's recommended Coating Repair Procedure.

ACCEPTABLE TO SANS 121: A

ACCEPTABLE FOR DUPLEX AND ARCHITECTURAL FINISH: A



F28

DESCRIPTION:

Reasonably sized articles that are required to be welded to hot dip galvanized components on site should be fully hot dip galvanized prior to welding.

CAUSE:

Design or fabrication errors can result in a cleat or component being omitted from the original hot dip galvanized component. All such added on components should where possible be fully hot dip galvanized and preferably using a masking material (see F40) or the coating at the weld ground off then welded on and followed up with appropriate coating repair.

Note: The reason why the zinc coating must be



F28 continued

eliminated by masking prior to galvanizing or ground off after galvanizing, to reduce weld spatter, weld cracking or lack of fusion.

EFFECT / REMEDY:

Depending on the size all additional cleats/plates that are welded in after the initial component has been galvanized should if convenient also be hot dip galvanized prior to fixing.

Unless comprehensively coated, any uncoated addition to the original structure will require more regular maintenance unless it too is hot dip galvanized prior to being welded into position.

ACCEPTABLE TO SANS 121:

A and REP if acceptable size.

ACCEPTABLE FOR DUPLEX AND ARCHITECTURAL FINISH:

R



Unless impractical or the site is in a remote area, all additional components or cleats should be hot dip galvanized and then welded on and the coating suitably repaired. If not, the additionally added cleat may not necessary provide the same service life to that of the hot dip galvanized component.

Mini Expo – Cape Region 2019





Acting Manager's Message

It is hard to believe that the 2019 door is closing and we are about to open the 2020 door, the year has truly flown by.

As I am sure you are all aware, Liz Rathgens, Accounts Administrator, and Hendrick Rasebopye, Executive Director, both resigned in August 2019. Liz's position has been filled by Liesl Kiely and the new Executive Director will take up position and duties in January 2020.

The AGM took place on 12 September 2019. It was a particularly successful event which saw Donovan Slade handing over the Presidency to Gregory Combrink.

We would like to thank Donovan and his team for their hard work during the past two years.

A very warm welcome is extended to Greg and the new Council Members whose names and positions are listed below. We look forward to a fruitful and productive working future with you all.

Executive Council - President and Council Members:

President: Gregory Combrink
 IPP: Donovan Slade
 VP1: Graham Duk
 VP2: Tebogo Bhulose
 Honorary Treasurer: Dave Raath
 Honorary Secretary: Ross Mahaffey

The CorrlSA Dinner Awards, with a delightful Great Gatsby theme, was held on 25 October 2019 at the

Wanderers Country Club. The evening, swinging with the foxtrot and loads of fun, was thoroughly enjoyed by all.

The Cape Town Branch held their Gala Evening with a Rock 'n Roll theme and reports were that just as much fun took place at the event.

In terms of student numbers, we are happy to confirm that enrolment for courses is gradually increasing and so this is an opportunity to express our deep gratitude to all the Lecturers who present and facilitate the courses. It is only through the excellence and commitment of the high standard of facilitation that training is effective, smooth and of exceptional quality. The Corrosion Institute of Southern Africa thanks each and every one of the lecturers for their expertise and their astounding contribution to the training.

Much like an army or a team, there are other players who contribute and are integral to the training intervention – the company members who supply the paint requirements and the companies who host the CIP 1 Practical Days; we salute these companies and their staff who generously and repeatedly engage, despite many other commitments and a busy schedule. The Corrosion Institute of Southern Africa is indeed very fortunate to be able to call on you all for assistance in making our practical days so successful and impactful.

Last, but by no means least, we would like to wish one and all a fabulous festive season and a happy, prosperous new year. Safe travels. We look forward to seeing you in 2020.

CorrlSA Annual General Meeting 2019, Gauteng

On the 12th September we held our 45th Annual General Meeting (AGM) where Mr Gregory Combrink was handed the presidential chain and is now recognized as the new president of the institute, congratulations to him and his executive committee, Graham Duk (vice president 1), Tebogo Bhulose (vice president 2), Ross Mahaffey (honorary secretary), Dave Raath (Honorary Treasurer) and Donovan Slade (immediate past president).

Later that evening, the members got a chance to cast their votes for the council members and at the end of the day Nomagugu Mthimunya, Pieter van Riet, Johnathan du Plessis, Sasa Methola and Laetitia Ngalula were elected as our council members for the year 2019/2020.

We also took to a minute of silence to honor our late honorary secretary Mr Mboneni Murvha who passed on in the month of August, may his soul continue to rest in peace.





Comment – Chairman of the Cape Region

Since my last report the Corrosion Institute Cape Region has had our AGM which coincided with a Ten Pin Bowling evening, our Mini Expo, a site visit to the Docks and our Annual Gala Dinner.

Thanks to David Goldblatt and Eric van der Spuy for their contribution over the last year. They have now stepped down. We welcome Lucinda Blanchard and Bryan Bauermeister to the committee and we look forward to the value that they will add. Thanks to the rest of the committee listed below for all their input in making the Cape Region such a success. Everyone has made a contribution towards the ongoing activities, technical presentations and courses that have taken place in the Cape Region over the last year.

Our Ten Pin Bowling evening was a lot of fun as well as being a good opportunity for networking. We plan to make this a yearly event so we encourage others to join in.

The Mini Expo took place at Rand Air and is now into its third year. Thanks to all who attended and to our exhibitors. Congratulations to Corrocoat on winning the best stand award.

The site visit to the Simonstown docks was interesting and informative. We appreciate the kind hospitality extended to all the guests.

Everyone in the Cape Region really values the informative and educational technical presentations and site visits and the opportunity to network and we look forward to many more.

Our Gala Dinner was a great success and a big thanks must go to Tammy Barendilla and Esther for all their hard work on the night and in the lead up to the event and to Hilton Olivier for all his hard work in initiating the planning of the event. Four gentlemen were recipients of honorary life membership of the Corrosion Institute. A big congratulations to Steve Holt, John Houston, Terry Smith and Flippie van Dyk. Terry was also the winner of the best Technical Presentation for his very enlightening talk on galvanizing.

If you are new in the industry or one of the stalwarts there is something for everyone at our monthly get togethers and we encourage you to join us. Feel free to bring a friend.

Yours in Corrosion, Graham Duk on behalf of Bryan Bauermeister, Dan Durler, Daryl Livesey, Flippie van Dyk, Gilbert Theron, Hilton Olivier, Indrin Naidoo, John Houston, Lucinda Blanchard, Pieter van Riet, Terry Smith and Thinus Grobbelaar

2019 Annual General Meeting and Ten pin bowling evening, Cape Region



2019 CorrISA Dinner Awards: Gauteng



WINNING TEAMS AND INDIVIDUALS



Annual Award Category – Denso (Project submission #2 nominee).



Education Category – Sarel Marais – Corrosion in the Water Industry. Top Student.



Stopaq (Project submission #3 nominee).



Annual Award Category – NUI (Project submission #4 nominee).



Annual Award Category – Corrocoat (Project submission #1 nominee).



Corrosion Awareness Day – Kaefer (Best Stand Award).



Honorary Life Awards – Herman Potgieter (Honorary Life Membership).



Scholarship Category– Andile Blessing (2019 Ivan Ogilvie Research Scholarship).



Individual Medal Award – Neil Webb on behalf of Geoff Harris (Silver Medal Award).

THE ANNUAL AWARD GOES TO...

Eskom Medupi Power Station: Corrosion protection of 6 off stainless steel flue cans

Submission

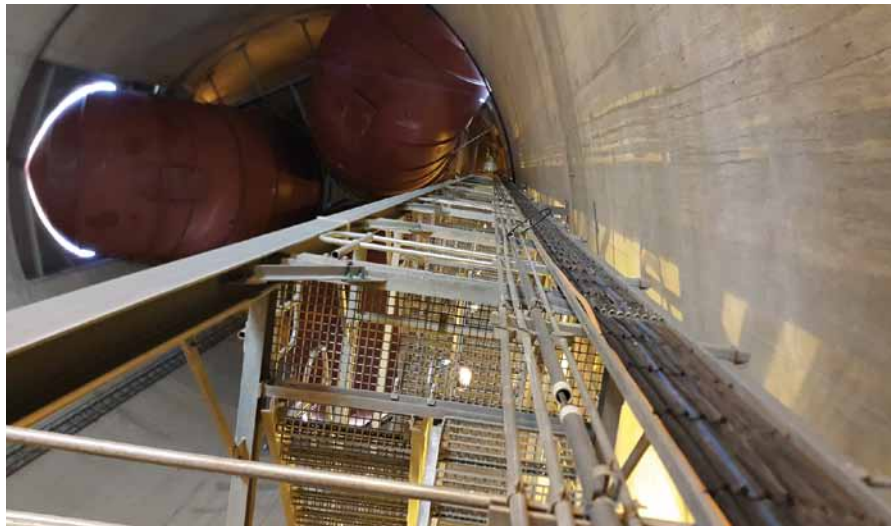
Corrocoat

Project summary

- 6 off 9m diameter flue cans to be corrosion protected with a total surface area of $\pm 2\,640\text{m}^2$ & 84 days.
- ± 800 litres of Corrothane XT (+ XTHA) & 3 000 litres of Polyglass VE (+ VEHA) was required to complete the scope of work.
- In addition approximately 132 tons of abrasive blast media (platinum slag), was required to be carried up to the top of the stacks, along with 3 x double chamber, double outlet blast cleaning pots and 6 off blast cleaning nozzles & various air receivers.
- 2 x 75mm diameter x 250 metre long lay-flat air lines fed by 2 off 10m^3 air receivers and 2 000 cfm of compressed air (12 bar high-pressure diesel compressors) were installed from the ground to the top of the chimney stacks, internally.
- All equipment and materials were winched to the tops of the stacks and all staff were conveyed using a ratchet-type 'Torga' elevator.

Project team

- Eskom Medupi
- KCJV – Eskom Site Projects
- Corrocoat SA (Pty) Ltd



SPECIAL AWARD

Precious Metals Refiners Anglo American:

Fire water ring main condition

This submission falls in the category of "STOOD THE TEST OF TIME" and is an excellent demonstration of the principle of correct choice of product for the circumstances / good surface preparation and high quality application resulting in an end product which withstands the test of time (in this case >30 years in service).



Notice the damage to the outer wrap. The outer wrap has "sacrificed" its protective layer. The outer wrap was removed to reveal a perfect, intact and undamaged DENSO petrolatum inner wrap.



Damaged outer wrap caused by the backfill.



The petrolatum compound has formed a protective layer even after the removal of the DENSO petrolatum inner wrap.

Submission

Denso

Project summary

Pipe diameter: 1" to 12"

Pipe length: Total of 1km

Anglo American Platinum is the world's leading primary producer of Platinum Group Metals (PGMs). They provide a complete resource-to-market service, supplying their network of global customers with a range of mined, recycled and traded products.

- The aim of the inspection was to determine the condition of the fire water mains since its installation in 1988. The condition of the pipe is an important assessment to safeguard fire water availability and to conduct possible

maintenance caused by corrosion after 25 years +. Three areas were marked up for excavation and the results of these excavations would determine the remedial action going forward.

- All three excavations found the Denso Outerwrap to be slightly damaged and this was probably caused by the backfilling of the trench. No damage was noticed on the Denso Petrolatum Tape inner wrap which was still found to be saturated with the petrolatum compound.
- The entire coating system was removed and the pipe surface was cleaned. No corrosion whatsoever was evident after 30 years + since its installation in 1988.
- The inspections reflect an excellent coating system which was applied as per the specification. This highlights the importance of recommending the correct coating system and applying the material in strict accordance with the specification.
- A 6" tie-in was installed and wrapped for a new fire water system installation at the Main Store using the original system supplied back in 1988!



Pipe in an immaculate condition.



A 55% overlap is ensured during wrapping of DENSO Petrolatum inner tape. This application will ensure long term corrosion prevention.

Project team

- Anglo American – Rustenburg
- Genrec
- Denso South Africa (Pty) Ltd



Here we see tie in wrapped with DENSO primer, DENSO petrolatum tape and DENSO outer wrap.

OTHER SUBMISSIONS

Lethabo Power Station: Northern Free State

Submission

Stopaq

Project summary

- The Lethabo Power Station Potable Water head tank is a Braithwaite type 24 metre x 24 metre square tank erected onto a 30 metre high steel structure and divided into two sections internally.
- It is a 2 division tank which provides the power station with potable water and fire water which ensures there is fire water in the event of a fire hazard.
- This tank could not be emptied and taken out of service for maintenance. The constant and increased leakages caused the foundation and ground or surface on which the tank was erected, to be constantly wet and pooling with water,

resulting in subsidence beginning to occur.

- Stopaq wet applied systems were applied underwater by a specialist diver team

Project team

- Eskom – Lethabo Power Station
- Delmon Mining
- Stopaq



Student poster competition

On the 10th October we hosted our "Annual Student Poster Competition". Alongside the competition we had a presentation from last year's Ivan Ogilvie winner, Miss Laetitia Tshimanga a graduate in chemical engineering currently busy with postgraduate studies in corrosion at the University of Johannesburg, on "Characterization of some locally produced abrasives and their influence on the surface profile of corrosion of 304 L stainless steel".

The CorriSA council members were the adjudicators of the poster competition and announced that H.L Maripane and M.K. Mufamadi won the first prize of R1 000.00, N.P. Tshikalange won the second prize of R750.00 and S. Mugivhi won the third prize of R500.00.



Cape Construction Expo

Cape Industries invited us to exhibit, as an association partner, at their show co-located with the Cape Construction expo that was held at Sun Exhibits during the 11 & 12 September. Events Co-Ordinator, Nonkanyiso Mabaso who manned the stand, reported that the show was very busy and kept her on her toes the whole time. She reported that we successfully painted our name in the Cape region and the attendees showed a big interest in the institute. Our magazine editor, Terry Smith, presented an informative workshop on "Controlling the impact of corrosion on asset lifecycles".

Thank you to everyone who visited our stand and showed interest in the institute.



OTHER SUBMISSIONS

Bidvest Tank Terminals: 6 Phosphoric acid tanks

Submission

National Urethane Industries

Project summary

- Corrosion protective tank lining – 6 000m²
- BKV Holdings Pty (Ltd) (coating applicator) completed the lining of 6 Phosphoric acid tanks located at the Bidvest Tank Terminal in Richards Bay totalling ±6 000m².
- National Urethane Industries (NUI) Pty Ltd Direct to prepared steel Rigid Polyurethane system was specified.

Project team

- Bidvest
- BKV Holdings (Pty) Ltd
- National Urethane Industries
- Avax Projects



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2019 CorriSA Gala Evening: Cape Region



From left to right: Flippie van Dyk, Steve Holt and Terry Smith receiving their Honorary Life Membership Award from Greg Combrink.

Corrocoat received the Best Stand Award for the Mini Expo.

Daiyaan Effendi receiving a Certificate of Membership on behalf of MRH.

Meet our 2019 #InspiringFiftySA winners!

This year marks the 3rd edition of #InspiringFiftySA Awards. We're once again impressed with the calibre of winners for #InspiringFiftySA. There are so many strong South African women in STEM! Here's to another 50 in the limelight, and rightfully so.

#InspiringFiftySA aims to increase diversity in tech, by boosting the visibility of female role models in STEM. It is a non-profit initiative that originated in The Netherlands and was brought to South Africa, by former Consul General, Bonnie Horbach in 2017. Our mission is to inspire more girls and young women to choose a career in STEM and our motto is very simple, namely that; "if she can see it then she can be it!"

Congratulations to the role models of tomorrow's future women leaders in STEM. You are proof that it is possible to reap the fruits of your hard work and talent. We have so much respect for you ladies!" said Sebastiaan Messerschmidt, Netherlands Consul General.

Ellen Fischat, The South African Ambassador for #InspiringFiftySA since 2018, says she was blown away by the talent and internationally recognized work of these amazing STEM trailblazers in South Africa.

Anita Nel, a 2018 #InspiringFiftySA Winner and Chief Director: Innovation and Business at Development of Innovus, had the following to say about the importance of the network, " #InspiringFiftySA became a business network of strong and successful women who actively support and truly inspire each other. It is a wonderful feeling to be part of something so special!"

Ellen Fischat says they are grateful for the support #InspiringFiftySA continues to receive from the Dutch Embassy of the Kingdom of The Netherlands and the Consulate General in Cape Town and that their new leadership team recognizes the importance and impact of the network and the women.

Dutch Ambassador Han Peters said that "Inspiring the girls and women of tomorrow is exactly what these top 50 women do. We are glad to be able to celebrate this achievement with them in the 2019 #InspiringFiftySA Awards".



There were 389 nominations received and it was a tough task for the judges to select them. It's been an honour and privilege to discover and learn about the amazing work these women do, mostly unnoticed and with persistence. They truly are the change agents our country needs and that she is humbled to serve these ladies and be a part of this amazing group of women.

Some of this year's judges included Irene Ochem, Founder and CEO of the Africa Women Innovation and Entrepreneurship Forum (AWIEF); Dr Mmaki Jantjies, Senior Lecturer, Information Systems from UWC, Professor Arnaud Malan, Department of Mechanical Engineering of UCT and Abongile Nzelezele, CapeTalk Presenter of The Early Breakfast Show.

We are honoured to congratulate and welcome the following women as this year's #InspiringFiftySA 2019 winners:

Aphiwe Hotele
Ashleigh Killa
Awiwe Funani
Balindiwe Sishi
Birgit Smythe
Bonolo Sedupane
Buhle Goslar
Dorreen Mokoena
Dr. Cherise Dunn
Dr. Noluxolo Gcaza
Dr. Paula Barnard-Ashton
Dr. Portia Manamela
Dr. Tozama Qwebani-Ogunleye
Duduzile Mkhwanazi
Ezlyn Olivia Barends
Fadzayi Chiwandire

Farhana Parker
Jayshree Naidoo
Keneilwe Hlahane
Kutlwano Hutamo
Leehandi de Witt
Lerato Dontache
Loretta Magagula
Lucy Cunnam
Lynette Hundermark
Maria Joubert
Mbali Makhathini
Mmakgosi Mosupi
Nisha Maharaj
Nobukhosi Dlamini
Noluvuyo Mpekelana
Palesa Mahlatji
Portia Maluleke
Prof. Debra Meyer
Raesibe Sylvia Ledwaba
Rene Parker
Reshmi Muringathuparambil
Safiyah Iqbal
Shamiso Kumbirai
Shubna Harilal
Sibongile Mongadi
Tabassum Qadir
Tebogo Makgatho
Tebogo Mokwena
Thembiso Magajana
Vanessa Sealy-Fisher
Yandisa Sokhanyile
Yolandi Schoeman
Yolandi Strauss
Zikhona Tywabi-Ngeva



Ross, what is your background and what did you study?

I grew up and went to school in Bloemfontein, from there I moved up north to study Civil Engineering at the University of Pretoria. From my undergraduate studies I developed an interest in water engineering and bulk water supply and subsequently completed an honours and masters degree in Water Resources Engineering, with Master Dissertation focusing on the geometric design of pump station pipe work utilising computational fluid dynamics.

Who did you work for before starting at C2D Engineering?

I was fortunate to receive a bursary from Africon/Aurecon in my third year of undergraduate studies, this was coupled with a position of a graduate engineer at Africon/Aurecon after the completion of my undergraduate degree. I continued at Aurecon for the following nine years, where I worked on a variety of bulk water and hydro power projects. It is during this time that I developed a passion for bulk steel pipelines and the condition assessment and corrosion protection thereof.

Give us a background summary of how C2D started and what they specialise in?

My business partner, Mr Kobus Prinsloo, started C2D in 2017, during this time I started looking for a new business venture and we decided to combine our distinct, but overlapping expertise to expand C2D's service offering. C2D is a boutique consultancy offering hydraulic analysis, pipeline design, corrosion protection, condition assessment, specification and optimisation services to the bulk conveyance sector.

We understand that you have volunteered to play an active role in CorriSA, why did you want to do this?

I initially joined CorriSA's Council in 2015, but decided to take a short break to spend

a bit more time with my then very young, growing family. I joined Council again in 2018 and was elected onto the current Executive Council. I joined to be able to plant some seeds to ensure that CorriSA is still active and remains relevant for the next generation of Engineers.

What ideas do you have and would like to propose for the ongoing success of CorriSA?

CorriSA needs to align itself with needs of the of the corrosion professional, corrosion related companies and corrosion engineering requirements of South Africa. The execution of the professional body and the alignment of CorriSA's training courses with legislative requirements and training gaps is of paramount importance the success of CorriSA and the integrity of South Africa's infrastructure. Further and more regular interaction of the other engineering professional bodies to align these items is required and proposed, both at institutional and academic levels.

What makes you want to attend the CorriSA Technical evenings and what subjects would you like the presenter to cover at these evenings?

The technical evenings expose those attending to a wide range of corrosion engineering topics and technologies, of which one would never had heard of if not for these evenings. Additionally, they provide great networking opportunities, where both business relationships and friendships are made. My favourite presentations are case studies, where the actual results, procedures and lessons are presented. This allows for the experienced gained by a few individuals to be shared to a much larger audience.

Do you try to encourage others within your organisation to attend?

My organisation is still emerging and is very small. I do however try and invite people to attend as far as possible. My current

portfolio at CorriSA include the technical evenings, where a big drive is to increase the attendance numbers. It is our intention to re-introduce CPD accreditation for lectures, which will require a high calibre of technical content and hopefully in turn a better turn-out.

One of the values encouraged by CorriSA members is the networking after the evening presentation, do you feel there is merit in this and why?

Yes, most definitely. A wide range of individuals regularly attend these meetings, from end users/clients, consultants, suppliers to contractors. This allows you to interact and network with individuals involved in all phases of a project, from inception to completion and maintenance.

During the time that you have attended the technical evenings, are there any specific incidences where what you gained from the presentation or subsequent networking at one or other technical evenings, you were able to successfully implement increasing the value provided to your client on the project you were working on?

I have built up numerous meaningful relationships with clients, fellow consultants and suppliers, where I can pick up the phone, ask a few questions or advice without having to provide a long introduction first. We have successfully completed various projects with partners identified at these meetings or with equipment from suppliers that we have met at the technical evenings.

Any other comments of how to encourage other engineering disciplines to attend?

Great technical content, good conversation, cold beverages and CPD points, I don't think much more encouragement is required. The field of corrosion and corrosion engineering crosses all engineering disciplines and there should be no exclusivity to these events.

CIP1 TRAINING COURSE: August 2019, Cape Town



CIP Level 1 course was held from 26th - 31st August 2019 at Kelvin Grove with a turnout of 14 candidates. Practical training was held at Corrocoat and the paint was supplied by Stoncor Cape Town. Thank you to both company members for always supporting CorrISA.

CIP1 TRAINING COURSE: September 2019, Midrand



15 Students attended the CIP 1 held at The CORÉ from 16th - 21st September 2019. Thank you Blastrite for hosting the practical day and to Hempel Paints for supplying the paint requirements.

CP1 TRAINING COURSE: October 2019



We had a successful CP 1 Tester course, 10 candidates attended from different industries which made the course more enlightening with knowledge and experience sharing.

CIP1 TRAINING COURSE: November 2019, Midrand



The last CIP 1 course for 2019 was held from 4th - 9th November 2019 at The CORÉ, Midrand. We had 16 enthusiastic candidates, who all seemed to enjoy the course. Thank you to Storm Machinery for hosting the practical day and to Kansai Plascon for supplying the paint requirements.

Durban Petrochemical Roadshow

CorrISA took part in the KZN Petrochemical Roadshow held on the 14th November at Amanzimtoti Civic Centre. On a rainy Thursday morning, events co-ordinator and KZN committee member Wayne Sloane went to set up at the venue for the exciting day. The show was said to go on from 09:30 – 16:00, but due to the bad weather conditions and weather reports the event only went on until 12:00. Thank you to those that showed interest in that short space of time and a huge shout out to Wayne for availing himself to assist in manning the stand alongside our very own events coordinator Nonkanyiso Mabaso.



CIP2 TRAINING COURSE: November 2019, Midrand



The last course for the year, CIP2, was held 25 - 30 November 2019 in Midrand. We had 13 students attend.

LINK TO COURSES: <https://docs.google.com/forms/d/1e9ZGdSMO1Sd8aXuCvys2bstXr5SrpVBxuqEQPK9lFUM/viewform?c=0&w=1>

The RUST Spot...



in conversation with Neil Webb

Briefly explain your background and how you came to be involved in the Corrosion Institute. What year did you join?

I studied Metallurgical Engineering at Wits University in the early 1970's and joined Michael Brett & Partners as a junior engineer in 1978. At that time the Corrosion Institute was based at Wits under the patronage of Prof Paul Robinson, and the monthly technical meetings were in the lecture room in the Richard Ward building at Wits. Working at MAB&P I had no option but to join the Institute as a member, but it wasn't until the mid eighties that I became involved in Council.

What was the state of the industry then and what role did you play within the institute? Right from the start I became involved with the educational activities of the Institute, and served on the sub-committees for several corrosion schools which were held every 2 years during the winter university holidays. I discovered that I had a natural aptitude for theme development for schools, seminars and symposia which culminated in the 1993 event "Pipelines – the Arteries of the Nation". This event sparked the inauguration of the Pipeline Interest Group within the Institute which thrived during the 1990's. When I joined the council I handled the education portfolio for some time, during which we attempted unsuccessfully to forge a relationship with NACE.

Talk about your years with the institute and what changes you've seen over that time?

When I started on council everything was done on a volunteer basis. The industry was booming with the development of new

gold mines and the extension of bulk water infrastructure, and companies could afford the time devoted to Institute affairs. Wits University provided the venue free of charge and we had technical meetings, a corrosion school every 2 years, a conference every 3 years and frequent 1-day symposia. The onset of QA initially had a negative effect on the coatings industry, as many organisations believed a tick in a box could replace an inspector with QC equipment. That fallacy took many years to dispel.

What successes did you enjoy during your time with the institute and what role do you play now?

I became intimately involved with the setup of SAQCC (corrosion) and was responsible for developing the modular structure of the level 1 and level 2 courses.

I guess my involvement and success within the Institute is reflected in my being awarded all three of the Institute medals over the years.

My current role is still related to education. I teach most of the available NACE and CorrISA courses and get involved with course development.

If you could go back, what things would you do differently?

It is difficult to say. You do what seems right at the time, and sometimes you look back and think that you could have done something better. You can't change the past, and all you can do is endeavour to pass your experience on to others so that the industry does not repeat the same mistakes.

What advice do you have for the industry going forward?

I think there are three principles that I would like to pass on:

- Pursue professionalism.

- No shortcuts. Do it right the first time.
- Get management buy-in. There is no substitute for quality.

Anything else you feel would benefit our readers?

I have always been involved in the design and quality control aspects of the industry. When I was a junior engineer, I had dealings with a senior engineering director in a public utility – he was quite fearsome and extremely competent. He is now retired, but an active technical peer reviewer for major infrastructure projects. We have known each other for 36 years. I recently worked with him as a member of an advisory panel where we had to put forward recommendations for corrosion protection systems which will have far-reaching commercial consequences. At the end of the meeting he said to me "You never did believe in issuing yellow cards, did you? – You always go for the red." I would like to be remembered for unbiased and factual evaluations, observations, reports and decisions, with no compromise.

Something about yourself: your new home, sports, women in your life, travel, passions in life?

I have always been passionate about railways, and steam engines in particular. In the last couple of years I finally realised a life-long dream and obtained my licence to drive a passenger hauling steam engine. Granted it is only a little one that runs on club tracks, but there you go.

I have to admit that after living out of a suitcase and in hotel rooms for 40 plus years, I am somewhat gatvol with travel. I think my record was 70+ return flights in one year! The strangest place was sleeping on the floor of an ablution block in the municipal campsite in Sishen because when we got to the site the Hotel had closed down.

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