

Corrosion Exclusively



INSIDE:

- Building a Corrosion Management System
- Modern Data Management Software
- Thrive – A South African Artist's Creation
- Video Game on Corrosion Awareness
- Fundamentals of a Coating System
- Cold Galvanizing is not Galvanizing





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- 26 List of advertisers

REGULARS

- 2 President's Comment
4 Editorial Comment
23 Comment – Executive Director
23 Comment – Chairman and Vice-Chairman of KwaZulu Natal
24 Comment – Chairman of the Cape Region

TECHNICAL FEATURES

- Corrosion Control
4 Building a Corrosion Management System Through Material Sustainability and Material Stewardship
7 Blastrite: Abrasive Selection in Surface Preparation
9 How Modern Data Management Software and State-of-The-Art Inspection Gauges Improve Efficiency of the Pipeline Inspection Process (Part 1)
14 The Fundamentals of a Coating
15 Thrive – A South African Artist's Creation
17 Video Game Focuses on Corrosion Awareness

Hot Dip Galvanizing

- 20 From the KETTLE
21 Specifying Hot Dip Galvanizing Correctly
22 Cold Galvanizing is not Galvanizing

INSTITUTE NEWS AND ACTIVITIES

- 21 Obituary: Mike Book
24 Strategic Planning Session
25 Corrosion Awareness Day
26 CorrlSA Events

EDUCATION AND TRAINING

- 27 Training Strengthens the Foundation Effectiveness in Corrosion Control
28 CorrlSA Courses

GENERAL

- 19 Letter to The Editor

CONTENTS

OFFICIAL MAGAZINE OF THE CORROSION INSTITUTE OF SOUTHERN AFRICA



PAGE 4



PAGE 15



PAGE 25



President's Comment

So Covid-19 seems to have come to stay in its different variants and waves. However, it seems like even though it is still going to be with us, many of us have come to terms with it and learnt how to live within the variety of restrictions that it has placed upon us. Social distancing, masks and sanitizing has by now become second nature and we now also have additional interventions such as vaccinations doing the rounds. Whether you are a supporter of getting vaccinated or not and whether you object to the vaccine being mandatory or not is a personal

conviction but life goes on and all we can hope for is that sanity shall prevail going forwards.

No matter what our views, 2021 arrived and the world had changed. For the Corrosion institute it was no different. Early signs were that we may have had to continue to run our courses online but as the alert levels changed, council and staff worked out a COVID level 3 protocol and after much debating Council made a decision that in September to run an exploratory "live" course. This was a resounding success and thus further live courses were resumed on a look and see basis depending upon the ruling alert level. Following on since then several more have been held with attendees strictly adhering to the protocols required.

Additionally, after having only held online technical presentations during the COVID restrictions, we recently had our first hybrid (in-person and online) technical meeting that was well attended. Prof Sandenbergh brought many of us to new insights regarding the tendency of and the rates of corrosion processes.

In July part of our country was rocked by civil unrest and riots that have not been seen in many a year. In KZN and Gauteng mainly much infrastructure was damaged by being raided by looters and some even burnt in the process. This led to many people being devastated at the losses that occurred for many having their livelihood lost in a few days of destruction. However, from the ashes like a Phoenix (and in Phoenix too) arose a new camaraderie with people having learnt that by standing together we can overcome and rebuild. In the aftermath in many of the debris strewn streets ordinary South Africans stood up to be counted and together began to clean up and rebuild. It was a remarkable outcome and many of those that had been part of the pillage realized that the time had come to rather build than to break down.

The past 18 months have been a difficult period for most Southern Africans with RSA unemployment figures reaching all-time highs. One can only wonder how this will influence the 1 November local election outcome with many adopting a wait-and-see viewpoint. This past period has also made many of our members consider the way that the Institute operates. In particular I had the pleasure of hosting the long-awaited strategic planning session with representation from the whole spectrum of our membership, council and staff members partaking in it. Some of our short comings have been formally identified and positive initiatives have resulted from this with which we will be moving forward after the approval from you our members have been obtained. Apart from sessions to inform you about the initiatives please also watch our newsletter and other communications going forward for more information regarding this. The basic plan is to provide an improved service, better benefits for members, more accredited courses, better marketing and better governance in the future.

From a general business point of view with the lesser restrictions associated with the recent lowering of the COVID alert level, the second half of the year has seen a slow but sure revival of business activity. It is nowhere at the level that it should be, but the signs are there that improvement is on its way.

With the end of my tenure as president within clear sight I'd like to thank all our members, our staff and the council members for their patience and support during the rather tough period that we have come through and as the year end nears I wish you all well for the festive season wherein you and your loved ones remain safe. May the new year be filled with new activity and prosperity that yields fruit beyond your imagination.

Kind regards

Greg



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Cover: One of Daniel Popper's other creations reaching out to a plethora of corrosion examples along the coast.

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Editorial Comment

The life challenges many of us had to face as well as the adjustments made over the last two years have been frankly quite frightening on many fronts. Most of us know friends or colleagues who have either been very sick or worst still have succumbed to this disease.



As this threat begins to subside as more are being vaccinated, we in the industry are reminded of the many other challenges we are facing, some of which include the depressed South African economy; the shortage and therefore increased cost of steel; undependable electricity supply; lack of infrastructure projects, lack of job opportunities, etc. etc.

For those in the zinc industry, it started off with a temporary shortage of zinc caused by the systems collapse at Transnet National Ports Authority; we then move onto the anticipated imminent increased cost of metallic zinc, mainly caused by the shortage of power in China forcing zinc smelters to cut output, then there's the adjustment of production by up to 50% to save energy by two extremely large European zinc producers and the list goes on and on.

Living at the coast one sees many examples of failed corrosion control coating systems and rusted steel. While the major cause of this may be insufficient maintenance of the coating over the expected service life of the component, it is more often the badly applied or incorrect corrosion control coating system applicable to that item exposed to that environment.

As members of the Institute we here in the Cape Region look forward to arranging face to face technical meetings again from early in the new year where those attending and seeking advice on corrosion control, can be appeased by a bunch of experienced members with a variety of cost effective solutions.

For the articles we have included in this edition please refer to the contents.

We include a comment from Executive Director Petra Mitchell, who now manages the Corrosion Institute of Southern Africa.

Graham Duk the Western Cape chairman and Vice President of CorriSA gives an account of the Cape Region and the Chairman Karyn Albrecht the KZN activities.

Under Education we include several recent NACE educational course's that took place since March this year.

We again wish to sincerely thank all our advertisers who under extremely trying financial circumstances continue to support the publication. It is again through the support of people and companies like yourselves that this publication will eventually be known as the "must read" magazine amongst all Southern African specifiers who require assistance when drawing up corrosion control specifications on behalf of their clients.

We also wish to thank our amazing contributors, who painstakingly offer us technical articles of extreme value.

As this edition is our final for 2021, we wish you all a much earned rest at the year end, stay safe and healthy, we'll see you early in 2022.

Just before finalising this edition, we learnt with deep sadness that a stalwart of our industry, Mike Book has passed away. We take this opportunity to wish Cindy and family God's amazing peace and strength at this sad time.

Terry Smith

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."

Building a Corrosion Management System Through Material Sustainability and Material Stewardship

By A.I. (Sandy) Williamson, P.Eng.

In 2016 NACE International released the IMPACT Study,¹ which underlined the importance of a properly designed Corrosion Management System (CMS) for organizations. The study also estimated that the annual global cost of corrosion was around 2.5 trillion USD, but more importantly showed that between 15 and 35% of this cost could be saved through properly applying current corrosion mitigation and technology. Since the release of the IMPACT Study, the IMPACT PLUS program has been used by a number of organizations to improve their CMS.

A well designed and implemented CMS is and should be a key part of an organization's sustainable business practices. Technical Exchange Group (TEG) 531X was formed four years ago to discuss the concepts of Material Sustainability and Material Stewardship, including how these concepts related to corrosion management.

What is a Corrosion Management System?

A CMS is a means of improving the implementation of corrosion control knowledge and tools within an organization. Furthermore, effective corrosion management has been shown to contribute to:

- Extension of asset operating life
- Reduction of risks to society and the environment
- Improved efficiency and effectiveness of corrosion control efforts.

The IMPACT PLUS Corrosion Management Maturity Model, which is used to assess



an organization's Corrosion Management system:

- Provides a platform for corrosion management professionals who desire to move their company to higher levels of performance.
- A common language and structure needed to ensure communication throughout all levels of an organization.
- Easy way for organizations to identify gaps in processes that could lead to the reduced lifecycle of assets.
- Foundational to an organization's goals for a more sustainable approach to corrosion management.

The IMPACT PLUS program is administered by the NACE Institute who has certified "navigators" to work with organizations in implementing the program.

What is Material Sustainability?

Sustainability has a broad definition and can therefore mean different things to different people. In 1987, The United Nations Brundtland Commission Report defined Sustainability as *"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."* The United Nations developed 17 Sustainable Development Goals (SDGs) in 2015 as a blueprint to achieve a better and more sustainable future for all. The role of the corrosion professional in contributing toward the UN SDGs was studied in an upcoming publication.²

Material Sustainability can be defined as the way materials are sourced, processed, manufactured into products, and maintained through the product lifecycle and redirected at their end of life. Current production and consumption models globally are unsustainable (see Figure 1). Total demand for limited resource stocks could reach 400% of the Earth's total capacity by 2050. Meanwhile, the safe boundaries for four of the nine key ecological processes and systems that regulate the stability and resilience of the Earth system have already been exceeded. The corresponding economic impacts of these current trends will be severe, with global price volatilities and supply chain interruptions leading to as much as US\$4.5 trillion in lost global economic growth by 2030, or US\$25 trillion by 2050.

Predictions of materials' supply constraints using reserve to demand ratios suggest that, within decades, we will be running up against planetary boundaries for several materials of industrial importance such as nickel, copper, and precious metals. Material Stewardship strategies in the 21st century should focus on decreasing this pace of consumption through the 4D strategies outlined in the next section.

What is Material Stewardship?

Materials Stewardship is concerned with managing the flow of materials into society to improve its sustainability by mitigating

environmental, economic and societal impacts and maximizing its efficiency and durability.

In more detail, Materials Stewardship investigates the maintenance and preservation of a material during its life span, including design, product ownership and second life use (remanufacture, reuse, recycle).

Four key strategies have been defined to pursue Materials Stewardship in what is known as the 4 D's approach³:

- Dematerialization
- Durability
- Design for multiple lifecycles
- Diversion of waste streams through industrial symbiosis.

Materials Stewardship provides corporations, government organizations, and their stakeholders a model for preserving and extending the lifetime of materials, thus reducing the rate of materials throughput, cutting waste, and preventing the social, environmental, and economic costs due to materials failure.

The Linear Economy vs the Circular Economy

A new economic system and business strategy has been proposed that moves industry from the traditional model that follows a "take, make, use, and waste" process into a circular model where products and

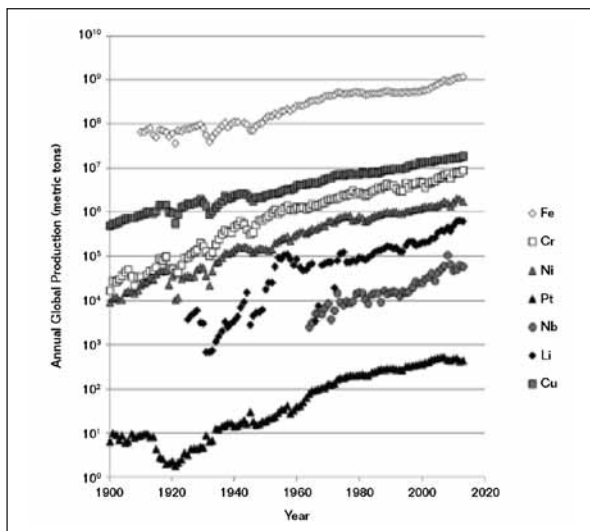


Figure 1: World production of several industrially critical materials as estimated from United States Geological Survey data.

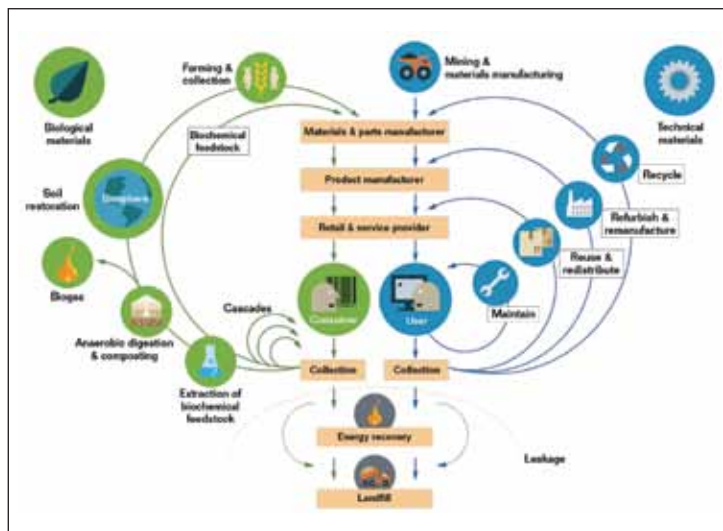


Figure 2: Circular Economy Systems Diagram (source: Ellen MacArthur Foundation⁴).

materials are kept within productive use for as long as possible, and when they reach the end of their use, they are effectively cycled back into the system.

By using the same principles that exist within nature, where biological materials are used over and over, we can design better systems for the use of technical materials (see Figure 2). Moving to a circular economy will not only support a more sustainable future but will help businesses identify new opportunities with innovative products and services while optimizing their operations and supply chains. Furthermore, there are significant energy savings to be realized when products can be reused rather than produced from raw material sources. Altogether adoption of more circular thinking will lead to more profitable and long-term businesses.

A number of areas requiring investigation for moving ahead with a circular approach are

identified in the recently published Circular Economy Handbook⁵. The four areas are:

1. **Operations:** Addressing the value lost through operations and by-products of business processes with respect to energy, emissions, water, and waste.
2. **Products and services:** Rethinking the design, lifecycle, and end of use of a product or service to optimize its usage, eliminate waste, and close product loops.
3. **Culture and organization:** Embedding circular principles into the fabric of an organization through redefined working practices, policies, and procedures.
4. **Ecosystem:** Collaborating and partnering with public and private sector actors to create and enabling environment for collective transformation. This includes examining the essential role of Investment and Policy.

The Circular Economy Handbook builds on a previous publication (2015), "Waste to

Wealth,"⁶ where a \$4.5 trillion opportunity was identified by simply redefining the concept of "waste" as a valuable resource. The following four categories of waste were identified:

1. **Wasted resources:** Use of materials and energy that cannot be effectively regenerated over time, such as fossil energy and non-recyclable material.
2. **Wasted capacity:** Products and assets that are not fully utilized throughout their useful life.
3. **Wasted lifecycles:** Products reaching end of use prematurely due to poor design or lack of second-use options.
4. **Wasted embedded value:** Components, material, and energy not recovered from waste streams.

Five business models (Circular Inputs, Sharing Platforms, Product as a Service, Product Use Extension, and Resource Recovery) were



Abrasive Selection in Surface Preparation

Blastrite is South Africa's largest manufacturer and distributor of granular abrasives to the surface preparation industry and offers a range of abrasives to suit the various surface preparation applications in the corrosion control process.

There are several factors to consider when selecting an abrasive for a blasting application, and Blastrite can assist with both the abrasives and the technical expertise in this regard.

When selecting an abrasive, consideration should be given to the following:-

- Is this a once-off or on-site blasting project where a disposable product should be used, or is there a recovery system where a recyclable abrasive should be used?
- What is the substrate that is to be blasted? Blastrite supplies abrasives for ferrous and non-ferrous substrates.
- What is the current condition of the substrate? Is there an existing

coating to be removed, is there heavy rust, or mill scale present?

- What is the desired condition of the substrate after blasting? In most instances abrasive blasting is done to create a profile (roughened surface) prior to a coating to create a key for the coating to adhere to. Other applications require a rubber lining to be removed, a surface to be peened, polished, or there is a desire for a certain aesthetic appearance to the surface.

Blastrite can assist with recommendations on the correct size, shape and type of abrasive. In all above examples products such as Blastrite Platinum Grit, Microblast Garnet, Steel Grit, Steel Shot, Glass Grit, Glass Beads and Aluminium Oxide can be used to achieve the desired results.

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introduced by the authors in order to capture the value of redefining waste. A number of organizations have used these business models over the past five years in order to adopt a more circular approach. In order to help organizations transition from their current business to a more circular model, a number of learnings for particular industries have been included in the Circular Economy Handbook.

The objective of better product recovery in reducing waste can be illustrated by designing for end of use disassembly, refurbishment and remanufacture. For example, the Scandinavian industrial group Moelven has designed walls for the interiors of buildings that can be taken apart and reassembled for a different design without requiring any new materials.⁷ As another example Sony uses up to 99% of recycled plastics in its electronics. This not only leads to using plastics multiple times but has the added benefit of lowering the carbon dioxide emission in Sony's TV production by 80%.⁸ Materials can be chosen that are recyclable or compostable at the end of use. Ecovative Design uses mycelium, a mushroom material as a bio-based packaging alternative to expanded plastic foams and other materials.⁹

Summary

The NACE IMPACT study has played a great role already in showing the global importance of corrosion management across many industries. A well designed and implemented CMS is and should be a key part of an organization's sustainable business practices. Significant overlap between Corrosion Management, Material Sustainability, and Materials Stewardship can be found. Organizations like the Association

for Materials Protection and Performance (AMPP; formerly NACE and SSPC) can help guide industries into a new era of more sustainable policies and practices. Material Sustainability and Material Stewardship initiatives provide AMPP an opportunity to foster a technical society of forward-looking, proactive professionals; equipped to support sustainability in tangible, meaningful ways through knowledge, standards and vision for future generations.

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How Modern Data Management Software and State-of-the-Art Inspection Gauges Improve the Efficiency of the Pipeline Coating Inspection Process

PART 1

By David Barnes¹ Elcometer Ltd, Manchester M43 6BU, UK

Abstract

The inspection of pipeline coating is crucial to the lifetime performance of the pipeline. Inspection during installation of the pipeline and as part of the routine maintenance programme is essential. It is often said that inspection processes save money by ensuring that relevant specifications are achieved but that writing reports for the inspection process cost money. One way to reduce the cost of inspection reporting and to speed up the inspection process is to use a data management system to present the inspection data in a consistent and organised manner. The automation of the reporting process is an important cost saving that allows more time to be allocated to the important task of inspection and the achievement of the coating specification.

There have been recent developments in both the design of reporting software and inspection gauges which together make achieving a paperless quality assurance system a reality for all protective coating applications. This paper describes the latest design and operational features of coating thickness gauges, dewpoint meters, surface profile gauges and other related gauges and describes how data can be easily transferred from the memory of these gauges into personal computers and mobile devices by running a dedicated software program for coating inspection data management. The creation of reports combining test results from a broad range of both digital and non-digital test methods will be discussed with particular emphasis on the use of Standard reports and the preparation of pre-formatted report forms.

Introduction

During the coating of steel structures several inspection measurements are required to be taken and reported in accordance with whichever standard the installer is required to follow.

ISO 19840 Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces and ISO 8502-4 Preparation of steel substrates before application of paints and related products – Tests for the assessment of surface cleanliness – Part 4: Guidance on the estimation of the probability of condensation prior to paint application are but two of the standards which may be used.

As important in this process is the reporting of the findings. Gauges are now designed with memory and connectivity capability to simplify and accelerate this procedure.

Coating Inspection

The process of applying coatings to steel structures is monitored from the preparation of the substrate, through the climatic conditions prior to application, the applied coating thickness and various properties of the dry film.

Before coating the surface needs to be prepared such that the required profile is applied and the cleanliness of the surface is confirmed to comply with the specification requirements of the coating.

The blast profile can be measured in various ways but one of the simplest and fastest ways to measure profile is to use a digital profile gauge.

The gauge is placed on the surface and the spring mounted needle measures the depth of the valley in which it lands relative to the peaks on to which the gauge is placed. Obviously measuring one valley on a blasted surface will not characterise the surface, so several measurements are taken (10 according to ASTM D 4417).

In order to characterise the whole surface under inspection correctly, the average of these 10 readings should be taken to give a more accurate assessment. This aligns with good Statistical Analysis practice.

SSPC PA 17 states that “Unless otherwise specified, select a minimum of three 15 x 15cm (or three 6 x 6 inch) locations in which to take readings for each specific surface preparation apparatus used during each work shift or twelve-hour period, whichever is shorter.”

In more recent times these gauges have been digitised and whilst they work on the same principle, data management and statistical analysis within the gauge is now possible. These gauges are now capable of having the measuring or contact point at the end of a cable to enable access in more hard to reach locations. The measurement procedure remains the same.

Having achieved the desired profile, the cleanliness of the substrate needs to be assessed.



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A new design of conductivity meter based on microprocessor electronic circuitry has been developed with features to make the assessment of surface contamination by soluble salts quick and easy.

The Saturated Filter Paper Extraction Method

Soluble salt measurements in general require two processes, the first is to extract a test solution with the salts from the surface, and the second is to analyze the solution to determine the concentration of the salt on the surface.

In the case of the saturated filter paper extraction method, cleaned filter papers are wetted with a controlled volume of pure water and the paper is then placed on the surface to extract the soluble salts. The paper is left on the surface for 2 minutes and then it is removed from the surface and placed on the electrode of the conductivity meter. The meter then tests the conductivity for this known area of the filter paper and the known volume of test solution. The result is displayed by the gauge as a value in $\mu\text{g}/\text{cm}^2$. Figures 1 to 6 show a schematic view of the measurement process for the saturated filter paper extraction method.

The soluble salt concentration includes the weight of both cation and anion. The reading is therefore derived from a total conductivity measurement. The gauge converts the total conductivity reading over the known area of the sample paper, calibrated as sodium chloride. To convert the reading to a chloride ion value assuming that sodium chloride is the only source of chloride ions, the factor will be 1.65 based on atomic weights. Therefore a reading of $2.0 \mu\text{g}/\text{cm}^2$ total salt level on the instrument would be divided by 1.65 to give $1.2 \mu\text{g}/\text{cm}^2$ as chloride.

USING THE SATURATED FILTER PAPER EXTRACTION METHOD

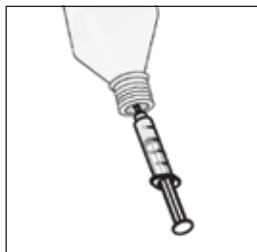


Figure 1: Fill the syringe with 1.6ml of high purity water.

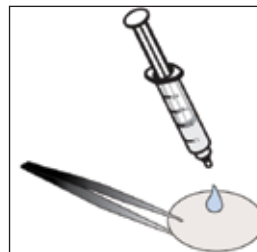


Figure 2: Eject the 1.6ml on to a clean unused sample paper, taking care to retain all the water on the paper.

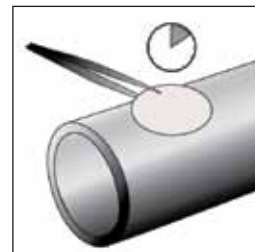


Figure 3: Place wetted paper onto the area under test, pressing firmly into contours and irregularities to remove any entrapped air.



Figure 4: After 2 minutes, remove the paper from the surface and place it onto the electrodes.



Figure 5: Close the lid.



Figure 6: The reading will be displayed.

In line with several modern electronic coating inspection gauges, the latest design of conductivity meter makes use of microprocessor electronics to enable operational features to be added to make the measurement of surface salt concentration and the management of the resulting data quicker and easier. Microprocessor electronics allow the gauge to be operated from a menu displayed on a large color LCD, with on screen charts and step-by-step guidance for the user in different languages and four large buttons that change their function depending on the area of the menu selected.

The gauge case is hand-held and fully portable for field use and is designed to be dust and water resistant to IP64 equivalence. The gauge uses large control buttons so that the gauge is easy-to-use when wearing gloves.

Having confirmed the cleanliness of the substrate the coating can be applied but the climatic conditions need to be acceptable for applying a coating.

It is now possible to determine the ambient climatic conditions using a rugged electronic gauge that contains all the functionality



Figure 7: The main parts of the salt contamination test kit.



Figure 8: Digital electronic dewpoint meter.

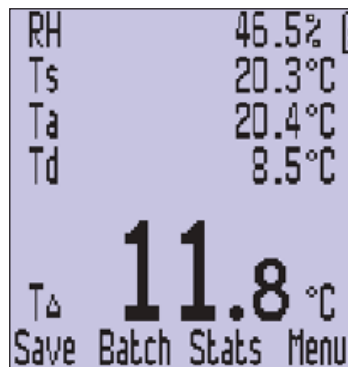


Figure 9: Electronic dewmeter display showing the RH, Ts, Ta, TD and TA values on screen together.



Figure 10: The electronic dewmeter with an external thermocouple sensor connected.

to make the "paint or don't paint" decision accurately and very quickly in a single gauge. An example of this type of gauge is shown in *Figures 8 and 9 on page 10*.

The Digital Electronic Dewpoint Meter is described in BS EN ISO 8502-4 as digital electronic hygrometers based on measurement of capacitance change of polymer films.

The Digital Electronic Dewpoint Meter

Digital humidity gauges have been available for some years but there is now a Dewpoint Meter that is designed specifically to monitor the paint process and that also provides a method for recording and presenting data as proof of the conditions prevailing.

The Digital Electronic Dewpoint Meter measures relative humidity (RH), air temperature (Ta) and surface temperature (Ts). Using the rh and air temperature, the gauge calculates the dewpoint temperature (Td) and then calculates the difference between the dewpoint temperature and

the surface temperature ($T\Delta$) and assess this difference against the 5°F (3°C) threshold that is used to determine if it is safe to paint.

A semiconductor sensor is used to measure the relative humidity so the measurement response time is much quicker than the traditional wet and dry bulb method that can take 20 minutes or more to reach steady-state conditions, at which point the temperatures of the bulbs can be read. This is particularly the case when the hygrometer has been stored in office conditions and then is used outdoors in different conditions of temperature and humidity. Even when an Electronic Dewmeter is taken from a warm office or car to a cold environment, an accurate reading of rh can be obtained in less than 30 seconds.

The air temperature is measured using another semiconductor sensor mounted close to the RH sensor to minimise any differences in conditions. The output from this sensor is displayed as Ta. The surface temperature is measured either using an integrated K-type thermocouple sensor

mounted next to the RH and Air Temperature sensors or by using an optional external thermocouple sensor connected via a K-Type connector. This sensor can be also be used for measuring the temperature of materials to be used in the process or for surface temperature monitoring during the process, data-logging. When an external thermocouple sensor is connected the integrated surface temperature sensor is disconnected from the gauge (*see Figure 10 on page 10*).

In some instances, test records for climatic condition monitoring require that the wet and dry bulb temperatures are entered into the record sheet so to make this process easier and quicker the Electronic Dewmeter provides estimates of the relevant wet and dry bulb temperatures based on the measurement of RH and Ta. The estimated values for the wet bulb temperature (Twb) and the dry bulb temperature (Tdb) can be displayed by selecting these parameters from the Display menu in preference to two of the usual set, e.g. Ta and $T\Delta$. Note – Ta will be the same value as Tdb.

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The digital format of the gauge allows sets of reading to be stored in memory for further analysis, reporting or archiving. Each set of readings consists of an RH value, the corresponding air temperature, surface temperature and the calculated Dewpoint Temperature and temperature difference, together with the estimated values for wet bulb and dry bulb temperatures.

The memory capacity is a maximum of 25 000 records or sets, in up to 999 different



Figure 11: Dewpoint meter configured for data-logging.



Figure 12: Example of scanning probe. While scanning the gauge is taking 140 readings per minute.



Figure 13: A scanning probe in use.

batches. Data can be collected either on command by pressing "HOLD" or using the preset interval data-logging feature. The preset interval can be adjusted from 1 second to 1 hour.

High limits and low limits can be set for each of the climatic parameters; RH, Ta, Ts and Td. High and low limits can also be set for TΔ but a default low limit of 3.0°C is preset in Celsius units with an equivalent of 5.4°F in Fahrenheit units. When set and activated by setting the high or low limit on in the "LIMITS" menu, the gauge gives audible and visual warnings when a limit is exceeded.

The display also indicates trends for the values on the screen; with the \square symbol indicating an increasing trend from the value and the \square symbol indicating a decreasing trend.

Data can be recorded using two methods; (i) user activated recording of values as and when required or (ii) the data-logging mode, with reading sets recorded automatically at the end of a pre-set interval.

In the data-logging mode the gauge is attached to the steel substrate by three strong magnets mounted in the back of the gauge case. The magnetic external thermocouple is also attached to the substrate

This arrangement is shown in Figure 11 above left.

The user operates the manual data collection mode via the manual logging batch option. After taking readings the user presses the "HOLD" softkey to lock the measurements on the screen. The options to "Save" or "Escape" (Esc) will be then be displayed and the user can choose to save the data or 'escape' and not store the readings.

Similarly the data-logging option can be chosen when a new batch is created. Adjusting the logging interval can be done on-screen. The default time is 1 minute and can be adjusted to be a shorter or a longer time interval to suit the user/application.

Once data has been collected either in manual or data-logging time interval mode

the statistical analysis of the reading sets can be viewed on screen. These statistics include the number of readings taken, the mean, the standard deviation, the coefficient of variation, the highest and lowest readings are displayed with a separate page for each climatic parameter, RH, Ts, Ta, Td, TΔ, Tdb and Twb. These pages can be scrolled through by the user.

Dry Film Thickness

When measuring protective coatings applied to metal structures, accuracy and speed of data collection are key aspects. The new coating thickness gauge approach to the measurement of coating thickness on a profiled steel surface allows for pre-programmed memories to facilitate the accurate adjustment and setting of the gauge for data collection along with a scanning probe to enhance the speed of operation.

Many electronic coating thickness gauges can store coating thickness readings in batches and these batches can be created using a pre-programmed calibration that simplifies the process of making new batches for a specific substrates profile. Typically there are three adjustment setting that correspond to the three levels of profile as defined in ISO 8503-1.

When using the two-point adjustment method while creating the calibration memory will ensure that the gauge accurately reads the coating thickness over the profile beneath.

The second recent development is that of the scanning probe for continuous coating thickness measurement (see Figures 12 and 13). This new design of probe allows for a 'snap on' replaceable end cap to prevent wear of the probe tip as it is dragged over the surface being measured. The wear cap maintains the accuracy of the probe and increases it's working life as even relatively soft coatings will cause wear and damage to any unprotected probe. The scan probes use a patented offset feature in the gauge, this ensures that the thickness of the wear cap is calibrated out of final measurement value of the coating. The gauge will also display a warning message when the cap has reached the point where the cap should be replaced as it is worn through use.

The gauge firmware has been enhanced to allow the scanning probe to operate in several modes for swift data collection into the memory of the gauge. In the first mode the probe can slide over the surface of the coating and when the probe is lifted the gauge stores all of the readings taken and displays the average coating thickness value, the highest thickness value and the lowest thickness value. Other scans over the surface will continue to add readings to the memory and the gauge will calculate the average, and display the maximum and minimum value for the total number of readings in the batch

In the second mode the gauge can be set to scan over the surface with the gauge collecting all the readings until the probe is lifted off the surface. At this point the gauge will store only the average of those readings along the maximum and minimum reading in that unique scan. Repeated scans will create a second measurement point in the memory that is the average and maximum and minimum reading of the second scan. This continues until the batch is closed.

The firmware also has a Counted Average function and using this with the scanning probe significantly speeds up the taking of the readings set as the counted average.

Additionally the Fixed Batch Size function allows the number of readings required to complete each batch to be defined by the user. The gauge will automatically create a new (linked) batch once the fixed batch has been created.

Job specifications for the determination of coating thickness often describe the number of individual thickness gauge readings to be taken as a spot measurement and the number of spot measurements for a given area. For example, SSPC PA-2 requires three gauge readings per spot and five spot readings in a 10m² (~100ft²) area.

With the Scan Probe and the Auto Repeat function, data that is compliant with the SSPC PA-2 method can be collected at a rate that is more than 40% faster than with the more traditional manual measurement method.

A counted average setting of three readings and a fixed batch size of five spot readings allows the coating thickness reading data, defined by SSPC PA-2, to be recorded for each inspection area and stored in its own batch memory. With the linked batches providing data for the whole structure that is being assessed. This feature also has the additional benefit of allowing each batch to be named to identify the location of the readings so that any corrective action can be limited to the area of concern, rather than being applied to the whole job.

Another feature of the scanning probe is a 'hold' function. This allows the probe to be removed from the surface for up to 1.5 seconds and then replaced on the surface to continue with the same scan; allowing for the probe to be lifted from the surface to clear obstacles such as welded joints and other obstructions.

Part 2 to follow.

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The Fundamentals of a Coating

The fundamentals of a coating could refer to several things, depending on the purpose or the use of the coating. For example, an antifouling paint would have the fundamental property of inhibiting the growth of animal or vegetable organisms on the coating. A fire-resistant coating must fundamentally resist burning, or at least retard the burning of the substrate. A coating to be applied over concrete must have a fundamental property of resistance to strong alkali.

All corrosion-resistant coatings, however, must fundamentally resist the corrosive atmosphere and prevent it from reaching the basic structure. Thus, there are as many variations in the types of coatings as there are in the forms of corrosion. The design of an effective anticorrosive coating is a complex task, which requires an extensive knowledge of not only corrosion principles but of the

science and chemistry of coating formation as well. Without such inclusive information, the development of effective corrosion-resistant coatings would be impossible.

A coating is not a self-supporting structure. It is part of an overall system, which includes the basic structure that supports the coating. Although it is always on a substrate of one kind or another, a coating can be thought of in the same light as a building. In order to be strong, a building must have a heavy, carefully constructed foundation; in order to be durable, a coating must also have a carefully designed (formulated) and constructed (applied) foundation (substrate and primer). A building also consists of a number of interlocking parts – the foundation, the superstructure, and the roof – and each one has a different function. The corresponding parts of a coating are the primer, intermediate coats, and topcoat.

In the case of a small building with a relatively short, useful life, the foundation and superstructure may be minimal. The same is true of a coating applied only for decorative purposes where surface preparation, application, and long life may be easily overlooked. In the instance of a substantial industrial structure, however, durability, reliability, and long life are required. Again, the same holds true for an industrial corrosion-resistant coating, which likewise must be engineered with a properly prepared substrate, a sound foundation coat or primer, a strongly reinforced intermediate coat, and long-lasting weather and corrosion-resistant topcoats. In constructing a building, the substrate (the soil or ground) indicates the type and extent of the foundation since sand, clay, or rock all have different foundation requirements.

The same, of course, is true of coatings. The primer must be designed specifically for the substrate, whether it is steel, aluminum, concrete, plastic, or wood. In fact, the surface over which a coating is applied may be more important from the standpoint of long life and durability than the design of the coating itself.

The fundamental concepts involved in corrosion-resistant coatings, then, include those of coating protection, component design, component function, and coating formulation. Many coatings contain as many as 15 to 20 ingredients, each of which has its own function in the overall performance of the coating.

A coating system may employ one or more of the basic coating concepts of impermeability, inhibition, and anodic or cathodic pigments. While many coating systems employ only one of these concepts, some of the most successful anticorrosive systems combine two of the concepts into one coating system.

This article is adapted with thanks from Corrosion Prevention by Protective Coatings, Third Edition, Charles G. Munger, Louis D. Vincent, assoc. ed. (Houston, TX: NACE International, 2014), p. 63.



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Thrive— A South African Artist's Creation

By Warren Brand

One of the things I like most about my job is diversity. One day we'll be working on the interior lining system for a sour water tank at a refinery, and the next day I'll be on a flight to New York to inspect some mysterious corrosion on a variety of stainless-steel swimming pools and spas.

And then, even more distinct, was this project. The statue is called "Thrive," and it is the creation of the South African artist Daniel Popper. (Remember his name, as I predict it will become more and more familiar over time, as his work entralls the world.) It's about 30 feet (9.1m) tall and features a woman's upper body split in two.

Popper's works are substantially larger than life. They intertwine nature and a sense of organic structure, which is simply moving to behold in person. Also noticeable in person was a coatings challenge.

Distress Call

On my first meeting with Popper and his team, we found that Thrive needed a serious makeover.

We met at The Morton Arboretum in Lisle, Ill., which sits upon more than 1 700 acres of verdant, rolling Midwest soil about 30 minutes southwest of Chicago. Popper was commissioned to erect five spectacular, giant-sized, outdoor sculptures for a three-year exhibit.



Popper's process for these sculptures was new: This was the first time that he had some of concrete pieces built and shipped from China. That is, he designed molds; used a specialized, fiber-reinforced concrete; had them built in China; and shipped them to the Arboretum. He also had the concrete components painted in China as well.

The problem was, however, that as the team unpacked the pieces for Thrive, they noted that the paint was in serious distress. The paint was peeling and exhibited intercoat delamination, as well as disbondment from the substrate. Popper and his team started using hand tools to remove the distressed paint, only to find that the going was slow, inefficient, and tedious.

Here's why.

Time and Methods

There were several challenges, starting with time. Popper had a small crew from South Africa, and they had to assemble and complete four other sculptures in addition to Thrive. They couldn't do it all at the same time. Second, with me on site, we needed to figure if we were going to try to scrape and patch the distressed paint, or remove it all. Third, when putting the segments together, there would be seams that needed to be hidden and incorporated into the sculpture with specialized lightweight concrete. Fourth, in addition to repairing the seams, Popper needed to be able to apply the



lightweight concrete to various areas of the sculpture to impart nuance, wood grain, and other aesthetic touches that could not be captured with the molds in China.

In general, going over existing paint and coatings systems is something our firm recommends frequently – when technically warranted. I’ve found that there is a momentum – almost like gravity – for vendors, engineering firms, and others to choose to remove a coating system and replace it, rather than to perform the intellectual and technical rigor and evaluate if it can stay in place and be left alone, touched up, or overcoated.

On Thrive, however, a quick look at the repair and seaming concrete and paint indicated that all of the paint needed to be removed.

Mainly, it turned out that it wasn’t paint after all!

A Way Ahead

First, the repair concrete needed to be applied directly to bare concrete. In fact, in various areas where Popper needed to build up the concrete by several inches, the concrete needed to be ground, chiseled, or otherwise severely prepared in order for the new concrete to “bite” into the old.

Second, the paint Popper intended to use on the entire sculpture was not paint at all but a concrete stain, which is a completely different animal.

I had only worked with a concrete stain once, many years ago, as it is typically considered decorative and not in the realm of my usual work in dealing with protective coatings and paint systems.

Two phrases from the stain’s product data sheet told me immediately that we weren’t in Kansas anymore:

1. Great penetration into masonry surfaces.
2. Avoid excessive coats, which can build film.

In our paint and coatings realm, film is everything. In fact, it’s the only thing. We build film in order to provide aesthetics and protect whatever substrate we’re tasked with protecting.

Stains, however, are very, very thin, and they are typically translucent. They require multiple coats to provide different shades and appearances. This would be terrible for a paint job that strives for uniformity, but perfect when trying to capture the nuance of a beautiful woman’s face – especially when it’s the size of a small bus.

Excessive coats were a no-go, which meant that all of the paint needed to be removed in order to open the pores and capillaries of the concrete, so that Popper could share his vision with us.

We now knew what we needed to do – but how should we do it?

The Right Prep

While Popper and his team had started to remove the paint with hand tools, the going was slow and inconsistent. To me, this meant that abrasive blasting was certainly the way to go. But, what kind?

The sculpture was located off a couple of walking paths and near a small, manmade lake. And work could only take place during normal working hours.

Normal abrasive blasting is loud and dusty. Further, blasting aggregate (typically sand, coal slag, or similar) creates an enormous, ugly mess. That would require either tarping large areas of the grass or encasing the entire sculpture in a tarp of some kind – a possibility, but it was not optimal.

This is where that project diversity comes into play. I had worked on a project a few years earlier in one of the largest hotels in Chicago. It was a fountain in the main driveway of the hotel, and it was enclosed

on all sides but the circular driveway, so dust would have been terribly problematic.

We had heard about fluidized blasting and floated the idea by a local vendor who had just purchased the specialized equipment. Unlike dry abrasive blasting (or wet abrasive blasting, which adds liquid water to the blast flow), water in a gas stage (aka vapor) replaces compressed air and can use many types of aggregates, similar to dry blasting. While loud as the dickens in this format, dust is reduced by more than 90 percent, and the production rate is nearly as high as dry abrasive blasting.

The contractor from the fountain job, who was a close working associate of mine, met the Thrive team two days later. He agreed to do the work within the next two days (in the rain, by the way), at his cost. We decided to use small glass beads as the aggregate because they were clear, environmentally safe, and disappeared on the grass and walking paths surrounding the sculpture. It was a win-win solution.

A Profound Outcome

On my first meeting with Popper and seeing Thrive before its makeover, I was stunned and moved at the sight of the sculpture. But after the artist and his team applied the various materials onto the properly prepared substrate, the change was surprising and profound. Despite the challenges, we found the right solution to bring this amazing piece of art to life in just the way that the artist had intended.

Our industry holds so many opportunities for the identification of optimal materials and practices; it remains a profound privilege to be a part of it.

ABOUT THE AUTHOR

Warren Brand heads Chicago Corrosion Group, a leading vendor-neutral consultancy. Brand’s career has covered more than four decades. He has owned an industrial tank



lining and coating firm and has written dozens of blogs and technical articles in a variety of publications. He has managed thousands of coating installation projects and developed specs for thousands of paint and coating applications. Brand, who is a certified NACE Level 3 and SSPC: The Society for Protective Coatings protective coating specialist (PCS), has earned an MBA and is a martial arts aficionado. For more information, contact: Warren Brand, warren@chicagocorrosiongroup.com.

Video Game Focuses on Corrosion Awareness

Corrosion simulation in a virtual city fosters understanding of corrosion control as a means to extend longevity of production facilities and infrastructure

What should you do if you want to save your city from corrosion? Should you apply coatings or use more corrosion-resistant materials? Should you focus on protecting utilities, or start with safeguarding the manufacturing plants? Do you have enough money in your budget? If not, how should you allocate your funds to ensure that the city doesn't succumb to corrosion and keeps earning income to pay for future corrosion prevention?

Making crucial decisions for mitigating corrosion and keeping three American cities from falling into ruin is the premise of CorrSim II, an interactive corrosion simulation computer game developed by MVE Systems (Palo Alto, California) in partnership with the U.S. Department of Defense (DoD) Office of Corrosion Policy and Oversight (Washington, DC) and the University of Akron (Akron, Ohio). The game, designed to create awareness of the consequences of corrosion, uses a city as the backdrop to teach the concept of corrosion control as a measure that prevents damage to property and the environment, protects public safety, and saves billions of dollars in corrosion costs in the United States. Game play focuses on the application of basic corrosion protection principles to combat the ever-present threat of corrosion degradation to facilities and infrastructure, and uses actual corrosion-related data and statistics along with high-quality graphics and animation to create an experience that is both appealing and effective.

The game is funded by the DoD Office of Corrosion Policy and Oversight. As part of its corrosion prevention and mitigation program, the DoD Corrosion Office strives to educate the defense acquisition community about the importance of considering corrosion protection in the design phase of new infrastructure and weapon systems, and broaden its knowledge of how to "design in" the best materials and the best corrosion protection processes. CorrSim II is helping the DoD to meet these goals,

as well as serving the Corrosion Office's broader objective of educating the general public about the importance of corrosion prevention.


Designed for All Ages and Professional Levels


According to MVE Systems, the aim of CorrSim II is to reinforce corrosion learning in the work force. Balancing corrosion protection methods and their strengths and weaknesses in terms of cost and longevity in real-world settings ensures that players will retain basic knowledge about the principles of corrosion. Other goals are to make corrosion learning more engaging for the public and, most importantly, attract the "wired" generation of youth to science, technology, engineering, and mathematics

(STEM)-related fields of study – particularly corrosion engineering as a field of study and career to pursue.

"CorrSim II offers pre-college-aged students a broad introduction to the challenges involved in preventing and mitigating corrosion on an array of buildings and transportation systems within a large U.S. city," explains Daniel J. Dunmire, director of the Department of Defense Corrosion Policy and Oversight Office. "The new game offers users insight into the actual corrosion prevention processes that facilities managers must oversee to maintain infrastructure across an entire municipality."

He notes that the DoD Corrosion Office and its partners designed CorrSim II





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both as a stand-alone game for middle and high school students, but also as a curriculum aid for science teachers interested in exposing young minds to the complexities of corrosion engineering. A lesson plan, "What is Corrosion and How Does it Affect our World?" (*available at www.corrconnect.org/simulations*) provides teachers with guidelines on how to utilize the simulation and focuses on several learning objectives. These include learning the basics of corrosion and ways to control and prevent it, observing that objects affected by corrosion will change over time, understanding the factors that affect the corrosion process, discovering examples of everyday corrosion, and understanding the importance of corrosion prevention and control.

"Ultimately, this newest simulation game should teach students the short-term and long-term economic effects of repairing and replacing equipment as a result of corrosion," Dunmire says.

Playing the Game

To start the game, the player is invited to visit a city in Ohio. Here, the player acts as a city manager whose goal is to protect five sectors of the city from deterioration due to corrosion. These sectors include infrastructure, transportation, utilities, government, and production and manufacturing. Each sector is equally important to the city's economy as a source of revenue. With a starting total budget of \$3 million and a yearly budget increase of \$500,000, the player must choose a preventive action, considered a maintenance expense, to mitigate corrosion. Choices include materials selection (plain, reinforced, or prestressed concrete walls, and steel or iron rebar) and/or coatings application (acrylic or elastomeric for the walls, and epoxy or galvanizing for the rebar). The cost, as well as the resulting durability (the number of years an asset is protected from corrosion), varies for each preventive action. At the end of each year, the maintenance expenses for each sector are subtracted from the total budget and the durability of the materials decreases.

There are four corrosion states that define a sector, depending on how well it is preserved – 1: well maintained; 2: rusting

and cracking; 3: crumbling; and 4: in ruins. Each sector's corrosion state is determined by wall and rebar durability; and the ability to maintain and preserve the sector depends on income, budget, and the cost of corrosion (maintenance expenses). When selecting an appropriate material and/or applying a protective coating, the player needs to effectively manage the budget.

"Since a given amount of money is available each year, the player needs to figure out what the budget should be used for," says Joshua Bane, who is involved with product management and training with MVE Systems. He notes that the best coating or

material may be too expensive, which would require the player to select a less expensive option so the maintenance expenses fall within the current budget amount and/or a portion of the budget remains available for use on corrosion protection elsewhere. The key is to effectively allocate the funds among the different sectors so all of them last as long as possible. If one sector is neglected and the durability of the materials reaches zero, then that sector will descend into the fourth corrosion stage – in ruins – and will no longer function and provide income.

During the game, the player will encounter other obstacles that affect efforts to protect



The game begins by visiting a city in Ohio in the United States.



The city in Ohio starts out in great condition with a corrosion budget of \$3 million and annual income of \$656,060.



Depending on how well they are maintained, each sector in the city can undergo four corrosion states.



Whenever corrosion progresses in any of the city's sectors, the city meter pointer moves to the left.



Poor corrosion management has left all sectors of the Ohio city in a deteriorating state.



Continued degradation from corrosion left the Ohio city vulnerable to a terrorist attack, which put the city in ruins.

the city from corrosion. Inflation will cause the price of coatings and materials to rise every year. Environmental events such as rain and hazardous waste releases will further decrease the durability of materials and coatings, particularly when the sectors are in lower corrosion states. Terrorist attacks that destroy parts of the city are imminent if the government sector is not in a well-maintained state.

Once the player has successfully maintained the city in Ohio for several years, then a city landmark, the John A. Roebling Suspension Bridge is opened and must be protected yearly from corrosion. If the player continues to successfully keep the Ohio city and landmark in good condition, then a city in Pennsylvania is unlocked and the player is able to manage corrosion for both cities. From there, the player who continues to keep corrosion at bay and prevents the cities from falling in total degradation is put in charge of another landmark, the Liberty Bell. Effectively continuing corrosion protection rewards the player with access to a third city, Washington, DC, and an additional landmark, Air Force One. If a player is able to maintain these cities and landmarks for 100 years, then a certificate is awarded. The game ends if the sectors fall into ruins and the cities can no longer earn enough income to pay for maintenance expenses.

CorrSim II builds on an earlier corrosion simulation game, CorrSim, which was first developed in 2011 as an outreach project of the DoD Corrosion Office. Available as an iPad and Facebook application, CorrSim challenged players to build their own industrial complex, a small area consisting of only a few structures, and protect it from corrosion using various corrosion control technologies. By expanding the game with a larger simulated venue that combines various sectors, multiple cities, iconic landmarks, and numerous challenges, CorrSim II provides players with a more realistic representation of the effects of corrosion and facilitates a deeper level of understanding about corrosion mitigation.

"The enlargement of the game emphasizes that corrosion isn't something that just happens in a small area – it really does affect

an entire city or state," Bane says. As players move through the game, it underscores how the impact of corrosion can affect a nation's industrial production, economic competitiveness, security, and defense.

Released in September 2013, CorrSim II is available as a desktop application for PC

and Mac and uses multi-touch technology for iOS and Android devices. To date, the mobile application has achieved 400 downloads and been featured on iTunes in 18 countries around the world. More information is available from CorrConnect, the DoD corrosion resource hub, at www.corrconnect.org.

Letter to The Editor [16 March 2020]

Greetings Terry,

It is with interest that I read your personal reflections in the editorial column of Corrosion Exclusivity Volume 6, Issue 1 of February 2020.

The challenge of informing a wide spectrum of role players in the advantages of all types of corrosion control systems is ongoing and we, the Hot Dip Galvanizers Association of Southern Africa, also find that significant efforts are required in this regard.

A full understanding of all aspects of corrosion control from in-service environments to life cycle costing is rarely vested in a single individual, but often requires multi disciplinary team discussions. Consequently we frequently assist and advise teams of Engineers, Architects, Fabricators and Project Managers in their deliberations.

Over and above discussions of the various corrosion control technologies, the appreciation of the standards that are to be achieved for each option is important. I am in agreement with your comments that standards and codes are frequently not fully understood. Without full appreciation of standards relevant to each type of galvanizing, errors in design, specification or during final quality assessment is possible.

The Hot dip Galvanizers Association, in existence for over 50 years in South Africa, is well positioned to assist in advising Engineers, Architects, Designers and Fabricators through one- to- one liaisons as well as through presentation of our courses related to Hot dip galvanizing.

These "marketing" efforts through technical education are in fact the cornerstones of our activities and a task we continue to tackle with relish.

Our reciprocal membership of the Corrosion Institute also places at the Institutes disposal a wealth of information and support to assist in any endeavours to promote a thorough understanding of hot dip galvanizing technologies and the standards related to the various forms of hot dip galvanizing.

Yours sincerely

Robin Clarke B.Sc. (Mech Eng.) SAIMEchE, Executive Director, Hot Dip Galvanizers Association Southern Africa

Dear Robin

I must apologise if my Editors Comment in Vol 6 Issue 1 was rather scathing on the HDGASA's efforts of technical promotion.

I do realise as you mention in your letter that technical promotion of all aspects of a coating such as hot dip galvanizing inspite of it having been around for about 180 years, always presents challenges. One of them maybe being that due to time constraints, senior specifiers generally never get around to attend presentations or courses where design and fabrication requirements are discussed.

It is for this reason in my opinion that siding with likeminded organisations such as CorriSA, IZA and champion individual consultants are most important in achieving best results for the hot dip galvanizing industry in the end.

Yours faithfully

Editor

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 F34 and F35.

Legend A Accept R Reject REP Repair	
F34 DESCRIPTION: Ungalvanized areas due to residual weld slag and/or contaminants at welds. CAUSE: A localised ungalvanized area at or near a weld can be caused by a weld slag deposit, weld porosity or weld undercut. Oxide deposits and residues from welding are resistant to normal pickling acids and must be mechanically removed by the fabricator before despatching the work to the galvanizer. EFFECT / REMEDY: Weld slag deposits should be removed by the fabricator by means of a mechanical de-scaler or abrasive blast cleaning. The deposit can also be removed by comprehensive chipping or wire brushing. Shielded arc welding as opposed to stick welding is preferred for components which are to be hot dip galvanized. ACCEPTABLE TO SANS 121: REP ACCEPTABLE FOR DUPLEX AND ARCHITECTURAL FINISH: REP	     
F35 DESCRIPTION: Weld spatter is oxidised, normally spherical expelled weld metal, that is deposited onto the surrounding material during welding. CAUSE: Weld spatter is caused by weld pool explosions when improper welding parameters are used, or if the material is dirty or contaminated. EFFECT / REMEDY: Loosely adherent weld spatter should be removed by the fabricator prior to hot dip galvanizing. Although not acceptable in terms of the specification the presence of tightly adherent weld spatter after hot dip galvanizing will not affect the corrosion resistant properties of the coating. ACCEPTABLE TO SANS 121: A ACCEPTABLE FOR DUPLEX AND ARCHITECTURAL FINISH: R - (A) A/C/REP - (D)	   

Specifying Hot Dip Galvanizing Correctly

The word "galvanizing" on its own can be and has in the past been incorrectly used, misinterpreted and misconstrued for other inappropriate coatings, which do not possess the same performance characteristics. These include "Electro-galvanized" and "Cold galvanized" coatings.

The "electro-plated" coating, also known as electro galvanizing, is deposited by an electrolytic process and the coating thickness is generally up to 10x thinner – although smoother and shinier than a hot dip galvanized coating. Bear in mind that the life of a zinc coating, no matter how applied, is more or less proportional to its thickness in a given environment. It therefore goes without saying that for a reasonable life, the electro-plated coatings must only be used in mild environments and least of all where the structure has been hot dip galvanized for long-term protection.

Most common construction sized hot dip galvanized nuts are now generally freely available as ex-stock items.

The designation "cold galvanizing" has been legally tested in Germany. Zivilsenats des Bundesgerichtshof said in a verdict of 12 March 1969 that "cold galvanizing" was an illegal product description. Locally, following some incomparable accelerated weathering tests, a company distributing a "cold galvanized" product made some outrageous claims through the media that their product was similar or superior to a hot dip galvanized coating. The test results to disprove their claims appear in the magazine "Hot Dip Galvanizing Today".

Following these outrageous claims by the company, the Hot Dip Galvanizers Association visited the Standards Authority, for advice. It was noted that most local specifiers and fabricators refer to a zinc rich paint as a "cold galv". The product is used when requiring site reparation work on a hot dip galvanized coating and it was suggested that to change this precedent would be an extremely costly exercise and almost impossible task.

After much discussion it was decided that where possible, all future reference to the metallic coating, galvanizing be referred to as "Hot Dip Galvanizing". Only through hot dip galvanizing does one achieve a

metallurgically bonded coating with its numerous benefits. It was agreed that the alternative products could not use the same name as they were applied at room temperature. Making use of the full name in all applications, in particular when writing a specification, would provide benefits to all role players involved in this industry*.

The Hot Dip Galvanizers Association Southern Africa would therefore welcome your future co-operation and assistance with this regard.

Incidentally, the name galvanised, although grammatically correct in terms of some reference books, is in fact spelt with a "z" in the Oxford reference dictionary and similarly it is used in any national and international specifications on the subject. The "z" is also the first letter of zinc, the material used to do the coating.

* When specifying, besides using the words "Hot dip galvanizing" include the specification:



SANS 121 (ISO 1461) for batch or general hot dip galvanizing.

SANS 32 (EN 10240) for tube hot dip galvanizing (flangeless with max. diameter 114mm and max length 6m).

SANS 3575I4998 for continuous hot dip galvanizing of sheeting.

SANS 675I 10244 for continuous hot dip galvanizing of wire.

In Loving Memory of Mike Book

It is with sadness that I write this message to inform you about the passing of one of our legends in the industry. Mike Book is gone.

Over the years Mike, a diamond in the rough, has touched the lives of many of us that knew him.

He rose from humble beginnings in Durban to become the owner of Bulldog Projects and achieved much in between.

I had the pleasure to work with Mike on several occasions and often asked him for advice which he freely gave.

He was a true entrepreneur able to be a gentleman when the times required it and able to roll with the punches with the best of them when the situation dictated it.

Mike did work in several other African countries and as a team with Cindy, grew Bulldog into the successful entity that it became.

He was a social "animal" and it was always good to spend time with him and to hear his laughter at the banter that occurred. Even though he also went through tough periods in his life I have seldom seen Mike without a smile on his face.

Our hearts go out to his wife Cindy and the rest of his family. May you find peace and strength to cope going forward with good memories and the knowledge that he left behind some footprints that many of us are trying to follow.

Mike you will be sorely missed.

Regards, Gregory Combrink – CorriSA President



Cold Galvanizing is not Galvanizing – Facts About Zinc Rich Paint

For many years, there has been debate over the relative merits of zinc rich paint and hot dip galvanizing. There has also been debate within the paint industry about the relative merits of one type of zinc rich paint compared to another.

This has generated a degree of confusion with end users of these corrosion prevention products as much of the information requires interpretation or may, in fact, be misleading.

Making Valid Performance Comparisons

Hot dip galvanized coatings have been widely used for nearly 180 years. The technology involved in their application has not fundamentally changed in that time. The main coating component (zinc) has also been a consistent component of the coating since its invention.

Thus, a hot dip galvanized coating applied to a piece of steel in 1900 is technically identical to a hot dip galvanized coating applied to a piece of steel in 2000. There is no difference in adhesion, metallurgy or durability.

For this reason, hot dip galvanized coatings have established an international reputation for consistent performance based on case history observation of the coating in service for over 100 years.

Zinc rich paints were invented in Australia in the 1930's. Since that time, the technology has gone through a number of manifestations in terms of binders, fillers and curing technology. The original inorganic zinc rich paints were heat-cured products. This technology was followed by acid-cured, lithium water based, potassium silicate water based, colloidal silicate water based, lithium/potassium (high ratio) water based and solvent based ethyl silicates.

Each of these inorganic zinc rich paint technologies has its own characteristics for hardness, durability, film-build and ease of application and comparison between them is not valid. The zinc rich paint industry

commonly uses examples such as the "Morgan-Whyalla" pipeline as a long-term case history. The technology used on this project has not been used for forty years!

Australian Standard AS/NZS 2312:1994 Guide to the Protection of Iron and Steel Against Exterior Atmospheric Corrosion, lists only two types of inorganic zinc rich paint of the six mentioned in AS 3750 - Inorganic Zinc Rich Paint. (Equivalent Standards in South Africa ISO 14713:1 and ISO 12944:5)

It is thus important to verify that the type of zinc rich paint being specified is the same as the type of zinc rich paint being used as a case history example.

How Much Zinc Do You Get?

The most important anti-corrosive component in both galvanized and zinc rich paint coatings is zinc. The mass of zinc present is the standard method of rating the durability of metallic coatings and all international standards use mass per square metre (or mass per square foot in the USA) to define coating durability for a wide range of galvanized products.

The amount of zinc in a zinc-rich paint (ZRP) coating is not clearly defined and the method of specification is misleading. Zinc rich paint specifications nominate the percentage of zinc by weight, in the dry film of the paint coating.

Thus, inorganic ZRP may nominate 78% zinc in the dry film and a high quality organic (epoxy) ZRP may nominate more than 90% zinc in the dry film. Because zinc is approximately 7X as dense as the organic binder material, the volume of zinc in a ZRP coating is much less.

The mass of zinc per square metre will thus be significantly lower than that of a galvanized coating of the same thickness. Tests done by South Australian Roads Authority in testing the zinc content of various types of zinc rich paint has found the following:

Inorganic Zinc Rich Paint

75 micron coating

Solvent Based 185g/m²

Water Based 280g/m²

Organic Zinc Rich Paint

75 micron coating

Solvent Based 185g/m²

Hot dip galvanized coatings range from 450g/m² on thinner steel sections, to well over 600g/m² on heavier structural sections.

Reliability Factors

There is no question that properly specified and applied ZRP coatings give excellent performance in many applications. However, as with most paint coatings, the quality of the application is a major factor in determining the long-term performance of the coating.

Using statistical methods, reliability factors of coatings can be estimated, where factors affecting coating quality are considered. With paint coatings, these factors include:

- Initial steel surface condition (new, rusty, contaminated)
- Surface preparation (blasting equipment, operator skill, access, design)
- Weather conditions (wet, dry, dew point)
- Paint application (equipment, operator skill, paint mixing, pot life)
- Paint curing (humidity, temperature, time)
- Handling (paint hardness, full curing time, handling methods)

With galvanized coating, the process involves chemical pre-treatments and metallurgical reaction between steel and molten zinc, which is process - rather than operator- dependent. The reliability of hot dip galvanized coatings in protecting steel in a given environment is an order of magnitude higher than that of paint because galvanized coatings never fail in service through application related factors.

We wish to thank Industrial Galvanizers (Australia) for this article.



Comment – Executive Director

Spring is here, can you feel it? A slight change in the air. A crispness that you don't remember being there a few days ago. Or maybe a shift in smells and sounds around you? As we make the final preparations for the 47th Annual General Meeting, members are reminded to forward their appropriate nominations to serve on Council on or before the 11th October 2021

Training is still ongoing; more information is available in the courses section of the magazine. The Institute after much negotiation received approval from AMPP to host their NACE Coating Inspector Program Level 1 (CIP1) and Coating Inspector Program Level 2 (CIP2) in Nigeria, West Africa. We are currently in the process of verifying all aspects such as safety, security, practical day host, and equipment requirements for the training. We have already received confirmation of generous equipment donations from DeFelsko Corporation and Elcometer. Storm Machinery and BAMR have agreed to import all the DeFelsko and Elcometer equipment on our behalf and pay the applicable duty/taxes for the donation. Thank you, DeFelsko Corporation, Storm Machinery, Elcometer and BAMR for your support in this endeavour. Please be assured that all factors will be considered before a final decision will be made to proceed with the training. Locally, we continue to adhere to strict Covid-19 protocols and processes, not only during training interventions but also for staff and visitors. We encourage all visitors to the Corê to make an appointment with the relevant staff member accordingly.

As communicated before, a meeting was set up again between the Department of Trade, Industry and Competition (DTIC) and CorriSA to discuss our sector and how our members can access incentives offered by the DTIC. This meeting was held on the 13 September 2021. Feedback will be communicated to

all members. The necessary assistance will be given to members, once the criteria are clarified by the DTIC.

I would like to remind everyone once again of the Technical Presentation opportunity that we have available online and face-to-face. Should you have an interesting topic, we would like to feature you. Kindly book your slot soonest. Technical Presentations are free. The Marketing Presentation option is also available at a fee.

Professor Roelf Sandenbergh from the University of Pretoria was the host of the first face-to-face Technical Presentation at the Corê since the COVID-19 pandemic forced us to move most of our activities online. He explained in depth the "Tendencies and Rates in Corrosion" to 28 attendees at the Corê and a few also joining us virtually from the regions. We also had Mr Craig Botha who took us through "AC Interference and Mitigation." This presentation was virtual via MS Teams on the 28th October 2021 and was very well attended and received.

I am happy to announce that our NPO registration is still active with the Department of Social Development and the necessary measures are put in place to keep it that way. Relevant compliance documents are compiled and will be forwarded to the department accordingly. Please feel free to verify our status on www.npo.gov.za

Last but not least, thank you to all the participants that contributed to the CorriSA strategy session, which was held on 12-13 August 2021. I have no doubt that the milestones set out will make a huge difference in taking the Institute to the next level. A full report will be forwarded to all members for approval and further input. Thank you again for your continued support, take care and stay safe.

Regards, Petra Mitchell



Comment – Chairman & Vice-Chairman of KwaZulu Natal

KZN Held a very successful *Not Just Rust* course earlier in the year. Thank you for all that attended and to ASP Rope Access for providing the training venue.

It has come to that time of year where we are planning our annual charity golf day, so please book your teams early.

The Corrosion Institute recently held the "Everything Industrial Petrochemical Roadshow". Unfortunately, the Durban show was cancelled due to inclement weather.

The show was also held in Richards Bay.

We are awaiting Covid 19 numbers to decrease in the province so technical events can be planned more accurately. We are always looking for companies and private individuals to come and present at our technical events. If you are interested, please do not hesitate to contact us.

Regards

Karyn, Marco, Wayne, Vusi, Roland and Cyril





Comment – Chairman of the Cape Region

Since our last newsletter, we have had the Covid third wave and a return to lockdown level 1, as well as riots and chaos countrywide. We are however a resilient nation and we do seem to have a way of bouncing back from hardship and challenges. On a positive front our balance of payments is in the best situation since the late 80's which is very optimistic and good for Rand stability and other factors that are good for the economy, which is expected to increase by 4.6% this year and a similar percent for next year.

National Virtual Technical presentations continue to take place and if you have a topic of interest then please get hold of us. We do hope that things will return to a semblance of normality, and we can meet face-to-face one of these days. I think the reality is that this is unlikely to happen this year.

We recently conducted a national Strategy Session with Exec, Council and a few invited guests which took place over a day and a half in Joburg. It was very positive and I would like to congratulate Greg Combrink, our President, for initiating this. The benefits from aligning ourselves to have one common goal is very important and finalising our Promise, Vision and Mission is critical. We assessed what is working, what is not working and came up with a list of Action Items that need to be accomplished by a set time.

Priority action items included:

- getting courses accredited
- moving courses to an online platform where feasible
- offering our courses in the rest of Africa where possible
- updating our website to be more interactive
- finalise roles and responsibilities including KPI's for all staff and role players
- plan how to attract new members

We do hope this initiative will be the start of more transparency and inclusivity and make the Corrosion Institute more relevant in industry.

Hopefully our next face-to face Technical Presentation / Site Visit will take place soon. We have several options in the pipeline.

Until then, keep well and stay safe.

*Yours in Corrosion, Graham Duk
on behalf of Craig Botha, Dan Durler, Daryl Livesey,
Flippie van Dyk, Gilbert Theron, Hilton Olivier, Indrin
Naidoo, John Houston, Johnathan Du Plessis, Lucinda
Blanchard, Pieter van Riet and Terry Smith.*

Strategic Planning Session

A quick summary of the strategy session:

- First day was spent looking at the Business Model Canvas including:
 - Customer Segments
 - Customer Relationships
 - Channels
 - Value Proposition
 - Key Activities
 - Key Resources
 - Key Partners
 - Cost Structure and Revenue Streams
- Second half day
 - Briefly discussing Vision Mission
 - Working out things that we are doing well
 - Working out things that we are not doing well and need to stop
 - Action items for urgent things that need to be done – date to be completed and person responsible



Corrosion Awareness Day April 21, 2021



This annual event takes place worldwide on the 24th of April and due to the public holidays we decided to host it on Wednesday, 21st of April.

Every year we've hosted the event at our premises, and we always had a great exhibition attendance and visitor turn-out. In 2019 we had the privilege of hosting it off-site at a large conference venue and included a conference programme. Due to the COVID-19 pandemic and lockdown restrictions, we had to cancel our 2020 event. However, with the ease of the lockdown restrictions we decided to host the event at a smaller conference venue – "Ambrosia Hall" – which included the conference programme.

All conference presentation slots were filled with great attendance by conference-goers. The current president, Mr. Greg Combrink, opened the event and welcomed all the presenters. They were NSTF – Richard Gundersen, ICP – Vanessa Sealy-Fisher, Mintek – Marandela Mulaudzi, UP – Prof.

Roelf Sandenbergh, Alike Africa – Kevin Richardson, TIPSASA – Barry Collins, SASOL – Murendi Rampai, Rob White – Independent Consultant, DTIC – City Phaahlamohlaka and SASSDA – Michel Basson. We managed to record the presentations with the assistance of Simon Lace from COMPEX. His team masterfully handled the smooth running of all the PA equipment. The conference ended with a thank you from our Executive Director, Mrs. Petra Mitchell.

Our exhibitors were amazing in that they arrived early and set up their stands and were eagerly awaiting the onslaught of visitors.

This part of the event was also well attended considering we had all the holidays looming ahead and a third wave warning. We were able to feast our eyes on the likes of Denso, BAMR, Blastrite, TIPSASA, Mintek, Bruno Steiner, Kaefer, SGB Cape, and yours truly CorriSA. Transvaal Galvanisers advertised on our conference programme.

One of our walk-in visitors was Midrand High School. Their students simply loved walking around and being entertained by the different gadgets and filling up their goody bags, sponsored by Southey and displaying their names on a lanyard, sponsored by Kansai Plascon, with keyrings and openers sponsored by BAMR. Their excitement peaked when they were hoisted up by SGB Cape's experienced rope access staff. They were also treated to a talk on NSTF's STEMulator e-learning platform as well as our very own "Corrosion Demonstration Area" which Vanessa Sealy-Fisher of Isinyithi Cathodic Protection hosted and absolutely thrilled the taste buds of the students with a live demonstration on how corrosion takes place.

Our local "Midrand Reporter" was present and everyone was interviewed and photographed. We also had our photographer, Mr. Wynand Nel of CREARE. GURU, capturing the event.

CorrISA Events

Technical Events

Dr Reza Javaherdashti and Dr Azeroo Assarian gave an interesting joint presentation on the 15th July titled *"Biodeterioration of Polymers and Composites and the Role of Anti-Microbial Coatings."*

Charl Cilliers provided an informative session on the 29th July where he presented on *"Additive Manufacturing of Corrosion Resistant High Performance Polymers."*

Jason Kulsky presented an exciting topic titled *"Black Powder Contamination (Corrosion Particles in Hydrocarbons) & Magnetic Separation"* on the 12th August.

Ben van Wyk presented on *"A Practical Guide to Fireproofing and Corrosion Protection"* on the 30th September.

Professor Roelf Sandenburgh presented on *"Tendencies and Rates in Corrosion"* on 14th October at our premises in Midrand.

Mr Craig Botha of Reignite presented a virtual presentation to an audience at our Midrand premises on *"AC Interference and Mitigation"*.

A big thanks to all the presenters for sharing their knowledge with our members and subscribers and also thank you to everyone who attended these informative sessions.

Please like and follow our social media pages for more updates on exciting events and presentations and also the joining links.

For more information and presentation opportunities, kindly email events@corrisa.org.za

Petrochemical Roadshows

The Corrosion Institute participated in the *"Everything Industrial Petrochemical Roadshow"*. Unfortunately, the Durban show was cancelled due to inclement weather on the 7th September but the Richards Bay show was held on the 9th September. Thanks to Karyn, the chairperson of our KZN Region, for manning the stand and also to everyone who took their time to visit.

A *"Petrochemical and Energy"* Roadshow was held in Sasolburg on the 19th October and then in Secunda on the 21st October. Members that attended received a discount for booking both roadshows. Strict Health and Safety measures were in place at both roadshows.

Why you should join us at the Roadshows?

- Meet active new buyers
- Boost your profile in the industry and add value to your brands
- Show your full product range in real life
- Meet your potential customers face to face, and accelerate the buying process



- Create valuable business connections
- Launch a new product and generate instant interest
- Develop a personal relationship with both the exhibitors & visitors
- Your elected company representative/s can achieve in a few hours what independently could take months.

For more information, please email events@corrisa.org.za

THE INSTITUTE AND EDITOR WOULD LIKE TO ACKNOWLEDGE THE ADVERTISERS AND THANK THEM FOR THEIR SUPPORT

BAMR	9 and 11
Blastrite	7
Corrocoat.....	17
Denso.....	3
Hot Dip Galvanizers Association Southern Africa	Inside Back Cover
ProGalv.....	14
Simple Active Tactics SA.....	Outside Back Cover
Transvaal Galvanisers.....	Inside Front Cover
Weartech (Pty) Ltd	13

Training Strengthens the Foundation for Effectiveness in Corrosion Control

By Anthony Botha of HDGASA

The world in the 21st century is a dynamic environment where shifting job functions affect the workplace with little or no management of change being considered. However this dynamic environment demands that we act proactively and use innovation to create significance in areas of value that previously never existed.

In choosing to move rapidly and innovatively we must never forego the foundation of knowledge. For when we ignore the vast amount of existing knowledge we undermine our own future efforts and having to be reactive, lose any gains we seek to provide.

In today's world, people are forever moving from one income stream to the next. Most of these movements are due to necessity rather than specialization in any one discipline. However very little effort is made to ensure an understanding of foundational knowledge exists when these changes occur.

We attempt to manage our lack of understanding of the foundational facts of what we are 'buying-in-to' by having a provider give us a guarantee or warrantee, as a written promise, to meet our perceived expectation. Even then, should we seek recourse the guarantee or warranty seldom satisfies our needs rather it shields the supplier with legalese and innuendo.

When several organizations participate in different areas of the manufacturing value chain, an unhappy situation can become apocalyptic.

The chain reaction, when the delivery does not meet the expectation, is to blame another entity lower down the totem for this failure. Escalation of perceived 'poor product' in order to secure an outcome closer to expectation is debilitating. Project critical paths can be shattered and costs may soar merely from a gap of knowledge.

Training is the only factor of production that does not suffer from the law of diminishing



returns. Applied knowledge, gained through training, strengthens the foundation for effectiveness and ensures best engineering practices grow rather than diminish an organization's value.

As we head further into the 21st century it is more important than ever to ensure that the needed knowledge is vested in personnel who link the efforts of the organization to the results being sought. Well trained personnel ensure effectiveness throughout the value chain.

Hot dip galvanizing is a proven reliable and for the most part predictable technology.

For those who need to use this technology it is simple, relatively inexpensive and long lasting in its ability to control corrosion. Hot dip galvanizing's foundational knowledge is exceptionally well documented over more than a century and a half.

As such solutions to any perceived challenges faced when dealing with this technology are readily available through a plethora of informational outlets and internationally accepted training courses provided by the Hot Dip Galvanizers Association SA.

For hot dip galvanizing, the correct specification and standards are invaluable.

The standards for fabrication and inspection of hot dip galvanized articles is therefore critical to avoid unnecessary delays and the associated cost creep that destroys viability of projects.

Courses on all aspects of hot dip galvanizing and the applicable level of knowledge are available at reasonable rates from the Hot Dip Galvanizers Association. From a basic lecture outlining hot dip galvanizing's role in corrosion control to a high level comprehensive three day course as a specialist and inspector.

The Association is available to discuss each organizations needs and provide a suitable training solution for each to ensure:

1. Knowledge of the facts regarding hot dip galvanizing and corrosion control.
2. Personnel are clearly acquainted with the hot dip galvanizing process and the applicable standards.
3. Are able to conduct a necessary activity or activities for the best possible outcome, when specifying and using hot dip galvanizing technology.

Full details of existing courses are available on the Hot Dip Galvanizers Association's website. The association is also available to discuss your particular training needs as they may arise by appointment.

CorrISA Courses

By Linda Hinrichsen, Course Administrator

CIP 1 Course: 15 - 19 March 2021

The first CIP 1 course was held from 15-19 March 2021 at the CORê. Thank you to Storm Machinery who hosted the Practical Day and Stoncor who donated the paint supplies needed. Providers like yourselves are always needed to ensure a smooth and successful training intervention. The Corrosion Institute of Southern Africa is very fortunate to be able to call on you for assistance in making our practical day such a success. Thank you, Bruce Trembling and Neil Webb, for lecturing.

Not Just Rust: KZN, 31 March 2021

A Not Just Rust course was held at the premises of ASP Rope Access on 31 March 2021. Thank you Marco Ashburner and his team for arranging this.

CP 2 Technician Course: 3 - 7 May 2021

The CP 2 Technician course that was scheduled for the 3 - 7 May 2021 was held at Big Tree Conference Centre with 19 students. Thank you to Craig Botha and Daniel Hovy for lecturing.

As we all know, thanks again to COVID's 3rd wave we have had to return back to the 'lockdown' cave. Due to this scenario, we have had to cancel the June and July courses. In saying that, the remainder of the year looks good for courses.

CP 1 Tester: Midrand, 30 August - 3 September 2021

The CP 1 Tester course was held at the CORê from 30 August - 3 September 2021. Everyone enjoyed the course and stated they had learnt a lot and would be putting all this newly acquired knowledge to good use. Thank you to the instructors, Neil Webb and Craig Botha for taking the time out of their busy schedules to lecture.

CIP 1 Course: Midrand, 13 - 17 September 2021

A CIP 1 course was held at The CORê from 13 - 17 September 2021 with 18 students attending. Seven of the students were from Angola and we trust they enjoyed the course and their stay in South Africa. Thank you to the instructors, Mark Terblanche and Bruce Trembling. A big thank you to our company members, Corrocoat Benoni who hosted the practical day and Sigma Coatings for the paint, epoxy etc donation. Providers like yourself are always needed to ensure a smooth and successful training intervention. The Corrosion Institute of Southern Africa is very fortunate to be able to call on you for assistance in making our practical day such a success.

AMPP News

As mentioned previously, I will be sharing news from AMPP that will be of interest/importance to all.

I still receive numerous calls with regards to the Ethics Course. Please note that effective January 1, 2021 all new certification and certification renewals will require completion of an Ethics Course. For more information, please visit the following link: <https://www.nace.org/education/courses-by-program/general-corrosion/ethics-for-the-corrosion-professional>.



CP 1 Tester: 30 August - 3 September 2021.



CIP 1 Course: 13 - 17 September 2021.



CIP 1 Course: 15 - 19 March 2021.



Not Just Rust: 31 March 2021.



CP 2 Technician Course: 3 - 7 May 2021.

Please note that the CP 2 course scheduled for 4 - 8 October 2021 had to be postponed. Once the amended dates have been confirmed, a notice will be sent out.

At this stage there is still no news about a CIP 3 Peer being scheduled in SA. Any changes on this will be communicated as soon as received.



The Hot Dip Galvanizers Association Southern Africa (HDGASA) is a not-for-profit trade organization, founded in 1965, dedicated to serving the needs of end-users, specifiers, architects, engineers, contractors, fabricators and hot dip galvanizers throughout Southern Africa.

To further this aim, the Association provides advisory involvement, training and information by way of courses, workshops, specialized presentations on corrosion control, technical research papers and case studies of hot dip galvanizing's effectiveness at corrosion control.

The Association liaises with regulatory and standards authorities governing the corrosion control and associated industries.

The HDGASA provides services for independent inspection against relevant standards and reviewing compliance against

the relevant standards by the stakeholders in the industry, and provides applicable analysis through metallurgical and SANAS approved analytical laboratories.

The Galvanizing Members of the HDGASA represent the majority of the hot dip galvanizing fraternity both by mass and value in sub-Saharan Africa. Through close liaison with the EGGA, AGA, Australian Galvanizers and associated organizations the HDGASA maintains a global presence and participates in arenas of common interest including the ISO standards.

The HDGASA publishes supporting literature such as our Steel Protection Guide, Design Wall Chart and Facts about Hot Dip Galvanizing. These are used effectively to bring third parties with little or no knowledge of hot dip galvanizing up to speed with the technology.

GAUTENG:

<i>ARMCO Isando</i>	<i>011 974 8511</i>
<i>ARMCO Randfontein</i>	<i>011 693 5825</i>
<i>Galferro Galvanizers</i>	<i>011 817 3667</i>
<i>Lianru Galvanizers</i>	<i>011 814 8658</i>
<i>Pro-Tech Galvanizers</i>	<i>011 814 4292</i>
<i>Silverton Engineering</i>	<i>012 843 8000</i>
<i>SMT Galvanizers</i>	<i>011 421 1495</i>
<i>Transvaal Galvanizers</i>	<i>011 814 1113</i>

WESTERN CAPE:

<i>Advanced Galvanizing</i>	<i>021 951 6242</i>
<i>South Cape Galvanizing</i>	<i>044 884 0882</i>

EASTERN CAPE:

<i>Galvanizing Techniques</i>	<i>041 486 1432</i>
<i>Morhot</i>	<i>043 763 1143</i>

KZN:

<i>Bay Galvanizers</i>	<i>035 751 1942</i>
<i>Durban Galvanizing</i>	<i>031 563 7032</i>
<i>Phoenix Galvanizing</i>	<i>031 500 1607</i>
<i>Pinetown Galvanizing</i>	<i>031 700 5599</i>



**HOT DIP
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ASSOCIATION**
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- Replaces glass bead and soda blasting
- Graffiti removal and building restoration
- General blasting

RECYCLED STEEL ABRASIVES

Key features and applications:

- Outstanding value
- Replaces slag abrasives
- Recyclable – ideal for tank internals and blasting booths

ECOBLAST® 30/60 GRIT

Key features and applications:

- Expendable abrasive – replaces garnet
- Approvals from major oil and paint companies
- Ultra-competitive performance

NEW STEEL SHOT/GRIT

Key features and applications:

- World class product
- Structural steel
- Castings
- Blasting booths

STAINLESS SHOT AND GRIT

Key features and applications

- Replaces glass beads and aluminium oxide
- Finishing non-ferrous castings
- Stainless steel fabrication

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