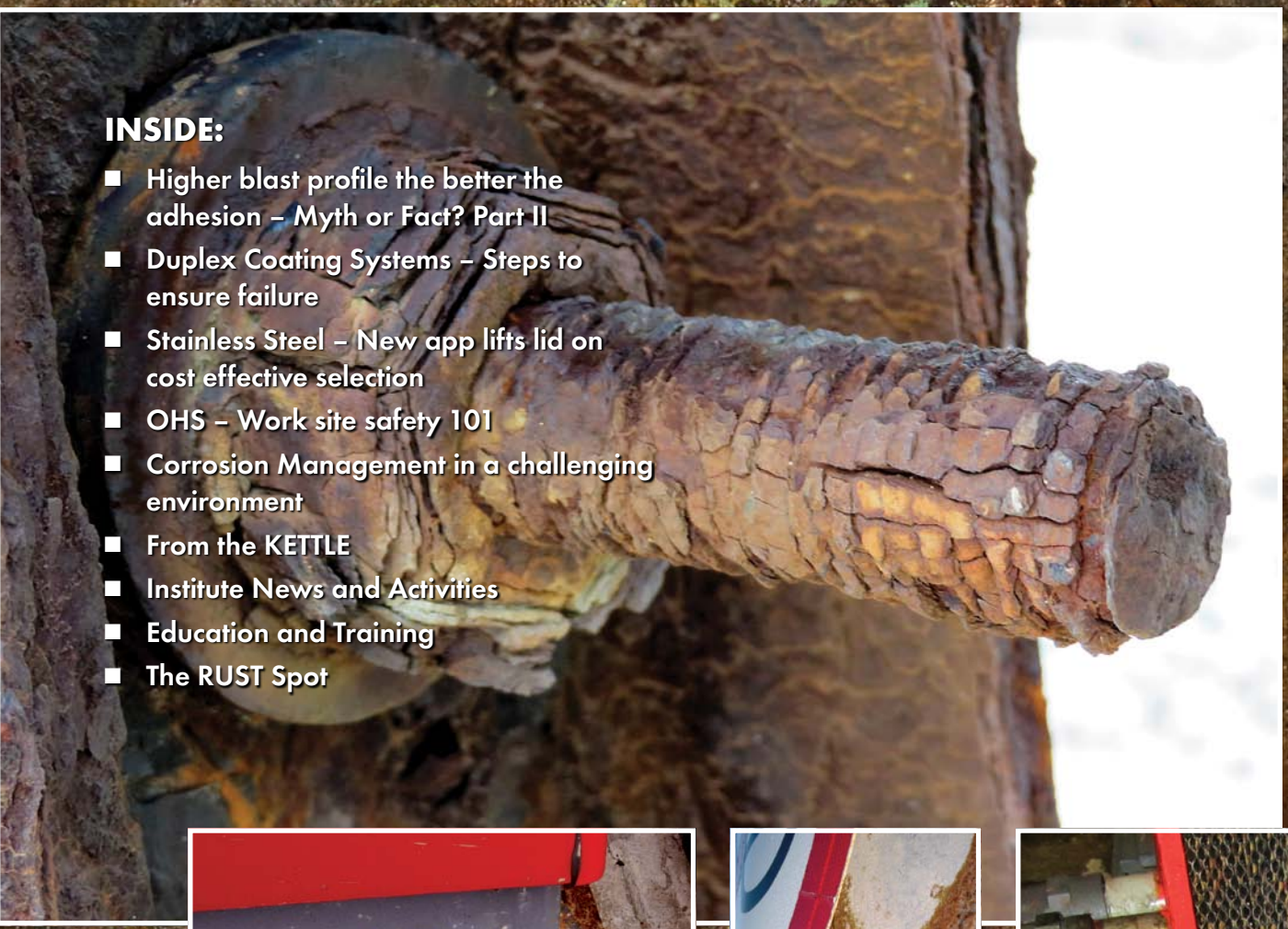
Vol. 2 Issue 3 | 2016

Corrosion Exclusively



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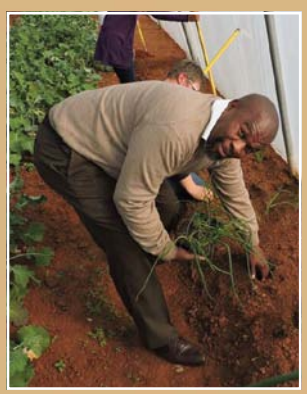
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President's Comment

The AfriCORR 2016 Congress was hosted in August this year in Midrand South Africa. It was a great forum for the interchange of ideas and research between academia and industry. Research papers and industry case studies were presented over the three days with 10 organizations exhibiting.

88 Delegates from various parts of Africa and the world attended the three day conference.

One of the key elements that came out of the Congress was the need for Trade and Industry to get more involved and to provide challenges for Academia to research.

A growing concern for me as the President of the Corrosion Institute of Southern Africa is that there is diminishing involvement and financial support from Asset Owners and State Owned Entities in the development of corrosion engineers and specialists. Without developing young minds, engineers, financiers and consultants and educating them about the economics and impact of corrosion, our ranking as the largest economy in Africa by the World Bank this year will be short lived. In 2005 it cost every South African around R250 per month for the cost of corrosion – what is it today?

One of the most important elements of the New Growth Path, initiated by Government, is a green economy, and the potential the creation of a lower-carbon economy has as a job generator as well as a spur for industrial development. If we can reduce the tonnage of carbon steel that corrodes daily in South Africa we could help sustain existing infrastructure whilst utilising the current manufactured steel to provide additional essential services to disadvantaged communities. This will naturally afford more career opportunities for qualified individuals and promote foreign investor confidence in the country.

This year's CorrISA Awards dinner is going to be hosted by the Western Cape Region in the beautiful city of Cape Town on the 18 November 2016. This is hopefully going to become a frequent occurrence where the institute travels between the various regions on a rotational basis and affords all our members a chance to have the awards dinner in their respective regions as it is important that we take the time to reflect on persons and or organisations that have made a difference and are worthy of industry recognition.

The present executive committee and regions have also decided that there is a need to carry out one-day workshop's in Kwa-Zulu Natal, Western Cape and Gauteng respectively, in order to afford our present and potential members the opportunity to discuss, in an open forum, the relevance of the institute and its constitution in today's times. I look forward to the constructive dialogue that is going to transpire.

Now that the warmer days are back, the invitation is still out there for you to join the various monthly technical evenings that are happening in the coastal and inland regions. If you are not yet a member and would like to become one, don't hesitate to email: members@corrisa.org.za.

Edward Livesey
President

OBJECTIVE OF THE MAGAZINE

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

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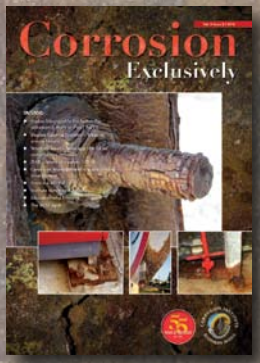

Cover: A collage of corroded components at the coast.

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Editorial Comment

The year is passing extremely quickly with only 80 odd days to go to Christmas.

It has given me great pleasure to compile this 4th issue of *Corrosion Exclusively,* the 3rd one in 2016 with the final issue of 2016 to be published a few days before the Annual CorrISA Awards evening happening on 14 November. Council has decided to move this annual event to Cape Town where it will be hosted by the Corrosion Institute of the Western Cape.

As *Corrosion Exclusively* is primarily intended to highlight corrosion related issues that we know take place regularly and those appropriate methods of preventing this unnecessary and enormous cost to the tax paying people in Southern Africa, we would welcome articles on the experiences of local readers.

The contents of this issue includes:

- Jim Gooden of Blast-One International concludes his article on "Myth or Fact that a higher blast profile increases coating adhesion".
- Mark Dromgool of KTA Tator Australia Pty Ltd providing his experience of Duplex Coatings (hot dip galvanizing plus paint) writes on "Steps to ensure that failures will occur!"
- Wesley Fawaz, Executive Officer of the Australian Corrosion Association Inc. contributes the article "Corrosion management in a challenging economy". ACA will also be presenting Corrosion & Prevention 2016 Conference in New Zealand in November. *See http://www.acaconference.com.au*
- Gerard A. Marley and Heramb Trifaley, both NACE Certified Level 3 Coating Inspectors and instructors, give an account of "Worksite safety 101 – A review."

John Tarboten, Executive Director of SASSDA tells us about a newly launched app which lifts the lid on cost effective material selection.

"From the kettle" continues the explanation of controversial hot dip galvanizing surface condition issues. Classifying them as acceptable, repairable or rejectable in support of the known durability of a hot dip galvanized coating.

AfriCORR has been and gone and Vanessa Sealy-Fisher, the chairperson of the organising committee, provides us with a detailed account of this exciting biennial corrosion conference.

The "Rust Spot" introduces a personality profile known to many in the corrosion control and protective coatings industry who retired in 2013, Dr Colin Alvey.

Lynette van Zyl the Office Manager of CorrISA who with her team of ladies, gives us an account of her experiences and challenges over this time.

Graham Duk the Western Cape Chairman as well as Ryan van Wyk the KZN Chairman provide us with feedback of their respective regions' activities.

Other activities of the Institute in Johannesburg include the President and selected CorrISA staff contributing to "67 Minutes for Mandela Day", technical evenings as well as Corrosion Engineering and NACE CIP 1 courses in both Johannesburg and Cape Town. KZN show off some of the players of their recent golf day.

Lastly, we pay tribute to the passing of two corrosion industry stalwarts, Dr Bryan Callaghan and Michael Brett. We honour Bryan with a tribute of his years of contribution to the industry by Greg Combrink. We will include a tribute to Michael Brett in the next issue.

Lastly, we wish the current receptionist at the Core in Midrand, Thobi Thubane God's richest blessings for the birth of her new baby. We look forward to hearing her good news!

Terry Smith

Myth or Fact:

Higher blast profile increases coating adhesion (Part 2)

By Jim Gooden, February 1, 2016

Independent surface preparation studies show no correlation between higher surface profile and coating adhesion. In addition, results of a test conducted by Blast-One International using a single ultra-high-build coating on various surface profiles verify this finding. Some issues remain unanswered.

In the past decade, five studies have been performed in the field of surface preparation that are pertinent to our discussion. Although the research projects referenced were not conducted specifically for this exact issue, they contain results that are of interest and relevance around the question of whether higher surface profile increases coating adhesion.

1. In 2006, CTI Consultants undertook blast testing with different grades of garnet. Four different grades were used. Some of the results of the research are shown below and there is no clear indication of any difference in coating adhesion across three different types of coatings, whether they are applied on a 30-micron profile, through to a 60-micron profile.
2. In 1983, Corrosion Control Consultants and Labs, working with the Michigan Department of Transportation, concluded that there have been more coating failures due to excessive profile than low profile. Bear in mind that this is in contrast to no profile. The test assumed that the steel had been blasted to create profile, but the profile was low.
3. In 2005, authors Roper, Werner and Brandon investigated the effect of the peak and valley count in the profile, commonly called the peak count. This is simply a measurement of the number of peaks and valleys in the profile. There are two outcomes from their research:
   - Across different profile heights, there was no differing effect on adhesion

- The peak count has no effect on adhesion

It is generally assumed that to increase the peak count, you must have a smaller profile because you are using a smaller abrasive. In addition, it is a general belief that a consistent profile height will provide better coating performance. A higher peak count generally means a low surface profile reading.

4. In 2011, Extrin Consultants looked at the adhesion of coatings over surfaces blasted with six different abrasives. This is extensive research with a large database of results. In those results, there is no correlation of greater coating adhesion being achieved on a surface with higher surface profile.

5. In 2008, Darren Ward from International Paints in the UK investigated profile shape – that is, the profile produced by angular grits versus rounded steel shots. He concluded that there is no significant difference in performance when comparing different grades of shot or grit.

Surface preparation and repairs underway on Pegasus barge, which will ship rocket components for deep space missions.
(Source: NASA/Steven Seipel)

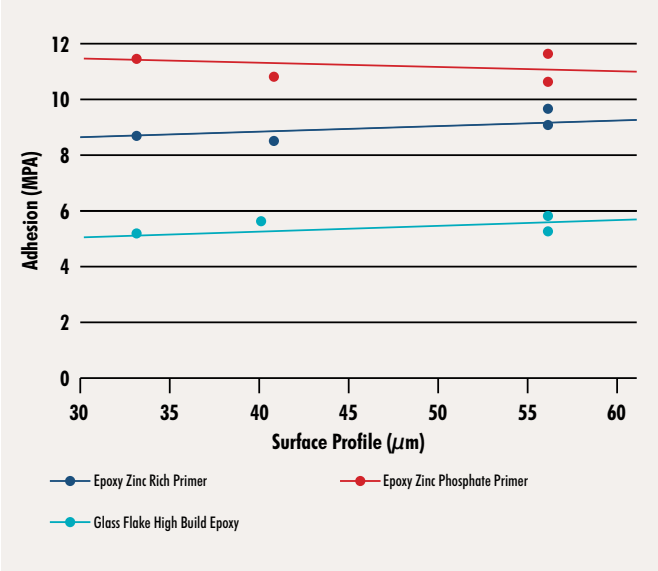

Figure 4: Adhesion vs. Surface Profile of three coating types.

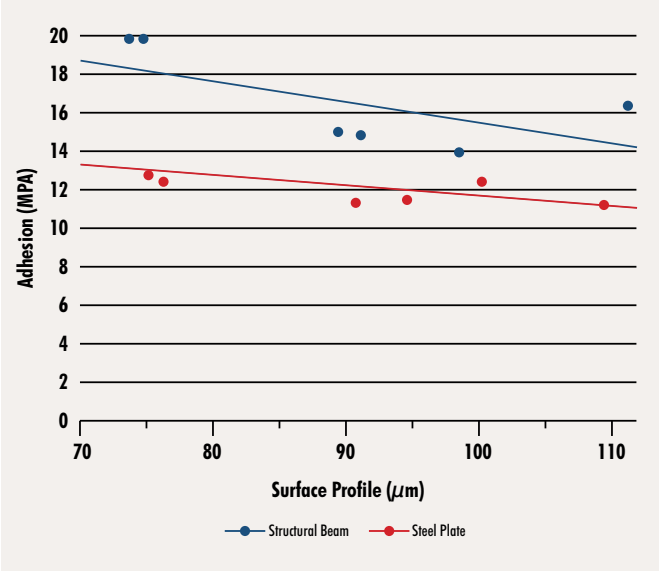

Figure 5: Two surface types, Adhesion vs. Surface Profile.

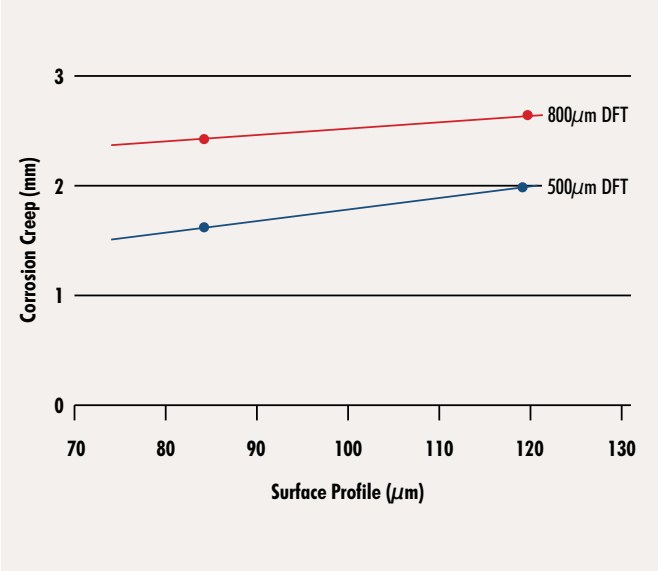

Figure 6: Corrosion creep according to ASTM 05894.

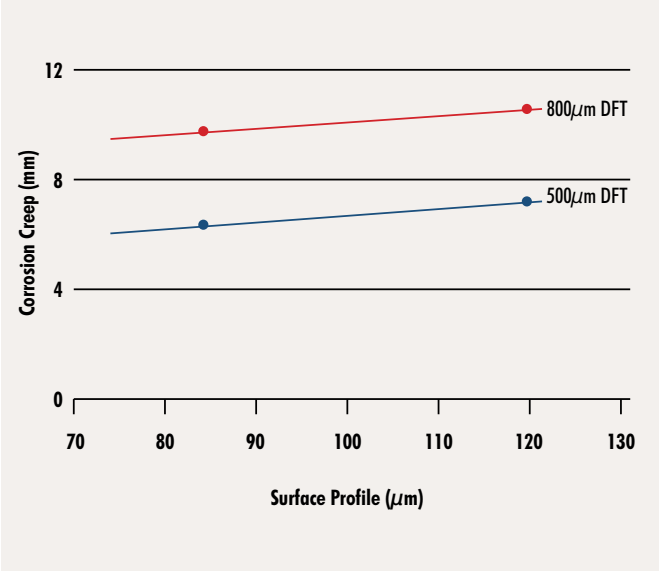

Figure 7: Corrosion creep according to ISO 20340 A.

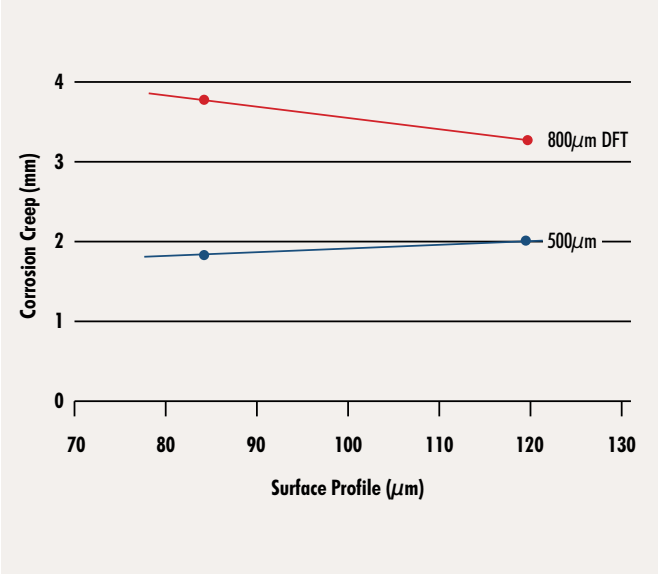

Figure 8: Corrosion creep according to NACE.

	DFT	Adhesion (psi)
Profile 25µm	**250**	**1680**
	500	**1623**
	1000	**1650**
	2000	**1620**
Profile 75µm	**250**	**1620**
	500	**1633**
	1000	**1601**
	2000	**1655**
Profile 125µm	**250**	**1623**
	500	**1580**
	1000	**1593**
	2000	**1601**

Figure 9: Test results.

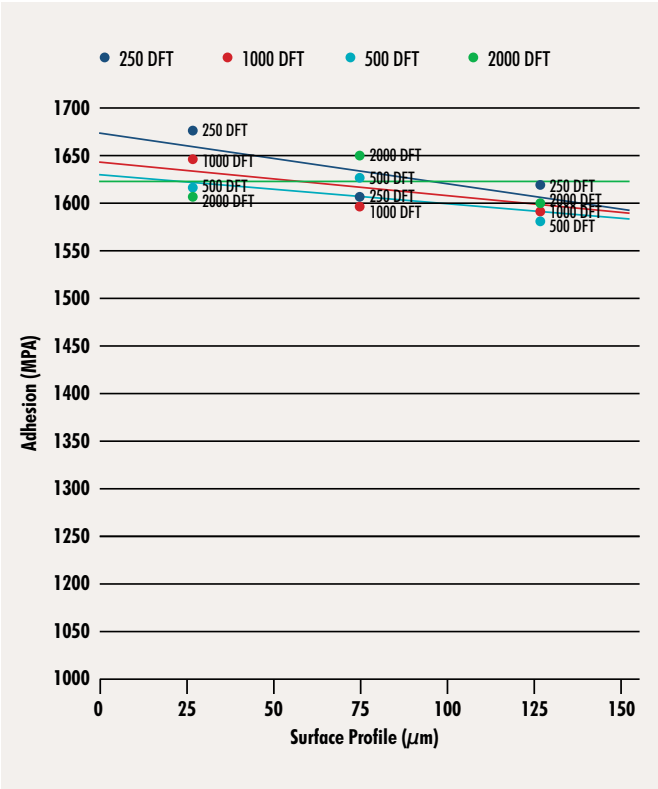

Figure 10: Adhesion vs. Surface Profile of solvent-free epoxy.

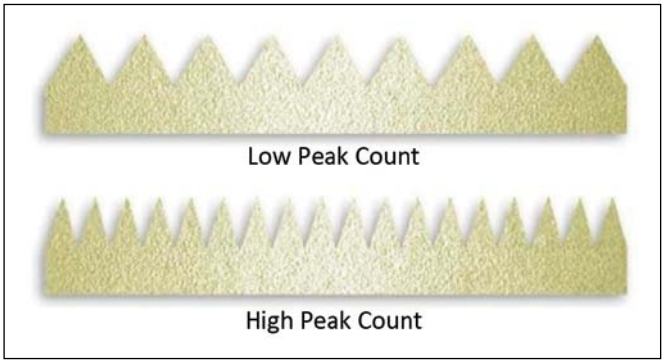

Figure 11: Low Peak Count vs. High Peak Count.

Blast-One research

To test whether profile height affects adhesion, we used a single abrasive type to a universally accepted cleanliness of blast. The same coating (a solvent-free epoxy) was applied in three different coating thicknesses to three different profile heights. We used Testex tape to measure the surface profiles.

Results are shown in the following tables with surface profiles of 25 microns, 75 microns and 125 microns surface profiles across and utilizing dry film thickness of 250 microns, 500 microns and 1 000 microns.

It is very interesting to note that a 1 000-micron coating on a 25-micron surface profile had very similar adhesion results to a 250-micron coating on a 125-micron surface profile. This leads us to conclude that there is no noticeable correlation and verifies that there is no statistical relationship between profile height and coating adhesion.

Our results also showed the limitations of utilizing Testex tape over a wide range of profile heights requiring the use of different Testex tape ranges and the variation between the different grades of Testex tape.

To calibrate the gauge for a 250-micron coating, 300-micron shims were used to create a rough surface calibration in order to get an accurate coating thickness reading of the full thickness of the coating above the tops of the peaks of the surface profile.

In conclusion – assuming that the results of the test provide a consistent profile shape, cleanliness and peak count – there appears to be no statistical reason to insist on higher surface profiles for higher-film build coatings, say above 400 microns, which is the lower end of the DFT range for solvent-free UHB coatings used today. This may be counter intuitive to the traditional thinking in the industry; however, this does correlate with other research done in the field.

Technical Director – Corrosion Control, Blast-One International

Jim Gooden has been involved with the corrosion control industry since 1989. He aspires to improve the quality of corrosion prevention projects through educating the various players involved. As technical director with the Blast-One International Group, he leads the global project team responsible for reducing the cost of corrosion control.

Remaining questions

There are other factors that will affect coating adhesion, which we know of. These include cleanliness or class of blast, the peak count, the profile shape and whether there is a profile. But there is still much debate around how surface profile should be measured:

- Testex tape vs. stylus gauges
- The particular standards to which the stylus readings are used for
- Whether to use R-t (total peak to valley profile height)
- The variation in profile readings from different ranges of Testex tape (a widely used profile measuring method)

There is also a question about what is a suitable minimum profile. Further research needs to be done in this area. The range of profiles discussed in this paper are from 30 microns to 125 microns, or 1 mil through to about 5 mils. This is the level of surface profile generally seen if the steel surface is cleaned by traditional abrasive blast cleaning or shot blast using Wheelabrator-type cleaning machines.

We do not have data to suggest that a lower profile than 25 microns or a greater profile than 125 microns will affect coating adhesion. With the research that has been discussed and more recent tests completed showing correlated results, one would be comfortable with assuming that if the steel is clean and there is more than a 30-micron profile, the chances of a well-established coating performing well on an adhesion test is very high.

DUPLEX COATING SYSTEMS:

Steps to ensure that failures will occur!

Mark B. Dromgool – Managing Director, KTA Tator Australia Pty Ltd
(Cert Engineering (Mech); PCS [Protective Coating Specialist] (SSPC); PCS (NACE); NACE-Certified Coatings Inspector – Level 3)

After many decades investigating hundreds of paint, coating and lining failures in all sorts of industries and in many parts of the world, I have found that a very common and reoccurring problem is the dramatic failure of galvanizing plus overcoat systems. My wording here is carefully chosen: it is not a failure of the organic paint system OR the galvanizing as individual items. It is the failure of the complete system!

For decades, the protective coating, painting and architectural industries have believed the promotion of what has been labelled as "duplex coating systems", i.e., hot dip galvanizing plus an organic topcoat system. It has been widely advocated that a life expectation greater than the sum of the potential durability of galvanizing plus the life of a coating system would result if these two were combined.

My research and too many investigations has indicated that this synergistic life expectation is rarely delivered, and in fact, I can show that a dramatic and sometimes catastrophic reduction in life or failure will quite likely occur if this duplex system – as it is commonly employed – is used.

What can and often does happen is that the complete coating system breaks down and it will sometimes do this in a few short years, i.e., well less than the life of just one of the coating system components, let alone anything like the sum of the individual life expectancies or any synergistic potential.

The process by which this breakdown happens is really quite simple, but it is takes a bit of explaining, particularly if the chemical reactions and physical descriptions are provided in full. This paper will briefly explain the basics of the process and provide suggestions on how this type of failure can be avoided.

Scenario

It is a regular situation that an architect, engineer or designer wants a corrosion protection system that also has some reasonable aesthetics. A common approach is to specify hot dip galvanizing, due to its perceived completeness of cover, corrosion protection and expectation of durability. However, galvanizing is grey and dull, and it changes its appearance from a bright silvery look all too quickly and it sometimes does this in a non-uniform way depending on its exposure. The solution often proposed is to apply a thin-film overcoat system over the galvanizing finishing with a polyurethane or similar topcoat. Theoretically, this should allow for a wide choice of colour, great UV stability, colour fastness and uniformity of appearance.

Figure 1: A typical dramatic failure of a galvanizing plus topcoat (duplex) coating system after four years of exposure.

What happens

In my experience, the basic misconception made by many architects, designers and coating supplier representatives is their belief that the galvanizing layer is providing the corrosion protection to the carbon steel, and all it needs is an aesthetic topcoat system

Figure 2: In some instances, the coating system will spectacularly self-detach from over the galvanizing.

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to change the colour or appearance. This is on the assumption that the steel is being protected with the hot dipped galvanizing layer that is (say) 80 to 120 microns thick, PLUS there is a further 70 – 80 or so microns of an epoxy tiecoat and a polyurethane finish coat, for a total build of (let's say) 150 to 200 microns. By most people's measure, that film build is commonly perceived to be enough to adequately protect carbon steel in a moderate or harsh atmospheric exposure.

Simply put, the error in this assumption is that the carbon steel is seen as being the reactive substrate, i.e., the material that is to be protected from corrosion. In fact, with a galvanizing plus topcoat system, the reactive substrate is the top surface of the galvanizing.

Ironically, if coating system designers were asked whether an uninhibited epoxy primer and a light coat of polyurethane (or a similar topcoat) to a combined DFT of around 70 – 80 microns would provide long term protection to carbon steel in a moderate to harsh environment, many would say it this is too thin and would soon fail. My question is that if this DFT of a low-order coating system is inadequate to protect carbon steel, what makes it sufficient to protect the galvanizing?

Metallic zinc, particularly in the form presented by a hot dip galvanized layer (as opposed to a powdered zinc in a zinc-rich coating), can be quite reactive. In fact, it has a higher electrochemical potential than carbon steel or iron, which is how and why it can sacrifice itself to protect steel galvanically to which it is electrically coupled. This is based on what is called the Standard Electrode Potentials (or the half-cell potential) of the two metals, zinc (Zn) and iron (Fe).

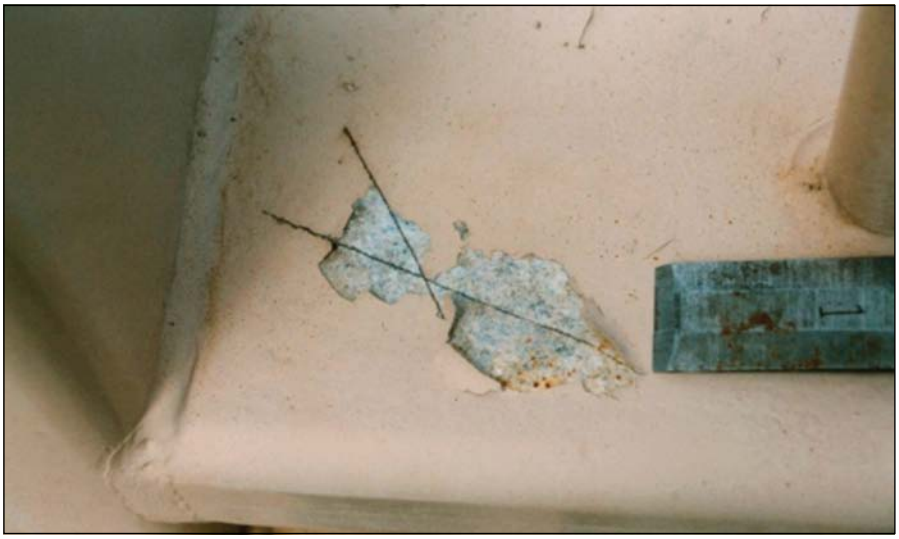
The oxidation half-cell reaction potential for zinc (relative to the standard hydrogen potential) is:

$$Zn \rightarrow Zn^{2+} + 2e- = -0.76V$$

The oxidation half-cell reaction potential for iron is:

$$Fe \rightarrow Fe^{2+} + 2e- = -0.44V$$

(The negative figure to the voltages in both cases is purely convention because of the electron's negative charge.)



(Above) Figures 3 and 4: A common finding is that the coating system is drummy with very poor adhesion, and underneath the film is a prodigious amount of white zinc corrosion products. Visible rusting of the underlying steel substrate (or the zinc/iron ally layers) also quickly appears with its typical red/brown corrosion products.

Thus, the potential for the zinc to oxidise (release electrons) is numerically greater than for the iron by the quantum of 0.32V, so when these metals are electrically connected together into a galvanic couple (in the presence of an electrolyte) the zinc will have a tendency or a potential to convert from its atomic form to its ionic form – by releasing electrons – greater than iron can do the same. The zinc then becomes an anode and the iron (or steel) is the cathode and is therefore protected galvanically.

However, zinc also readily reacts with oxygen, water, carbon dioxide and chloride to form a number of reaction products such as zinc oxide, zinc hydroxide, zinc carbonate, zinc chloride, zinc oxy-chloride, and others. Collectively, these are all called zinc corrosion products and they are mostly coloured either white or very light grey.

These zinc corrosion products have different levels of solubility in water. Zinc carbonate, for example, is almost insoluble; and some of the others are slightly higher on solubility. Zinc oxide is highly adherent and very protective of zinc in many environments.

To a degree, the insoluble or low-solubility zinc corrosion products can be quite strongly self-protective of an untopcoated galvanizing layer, i.e., they can shield over the zinc's outer surface and slow down the rate of oxidation (loss of electrons) of the zinc from its atomic form to zinc ions. This is partly why galvanizing can last so

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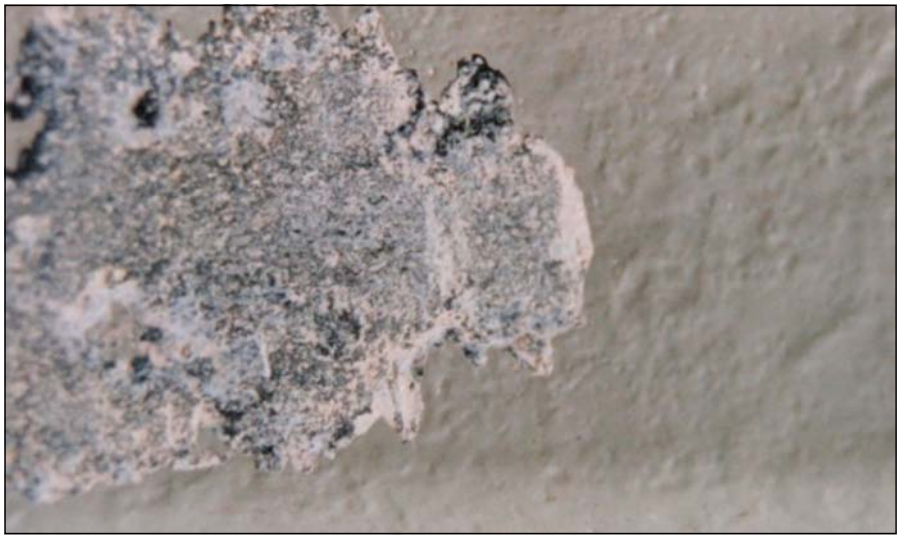


(Above) Figures 5 and 6: The rate of consumption of the galvanizing can be incredible to the point that the only remedy is to fully abrasive blast the steelwork and re-apply a new coating system or regalvanize the structure. However, in other cases remnants of the galvanizing layer will remain, slowly packing up beneath the coating film.

long on its own without suffering from a phenomenal rate of metal loss, providing the environment is not too severe. This explains the dulling effect of weathered galvanizing in benign environments (the white zinc carbonates and zinc oxides change the colour of the zinc from silver to grey); and the high build of a "coral-like" layer on galvanizing in a marine exposure.

Two things can interfere with the ability of the low-solubility zinc corrosion products to slow down the rate at which the oxidation reaction happens with metallic zinc. One of these is active and regular physical removal of the corrosion products, e.g., by wind, moving materials or flowing water; and the second is the time-of-wetness of the galvanizing. The latter item is quite critical.

We have already established that zinc is reactive in the presence of water. This is because water carries dissolved oxygen, which is the prime corrodent of metallic zinc atoms, and it also will dissolve some of the corrosion products of zinc, which will remove them from the zone of the reactions. If zinc remains almost continually wet (i.e., it has a long time-of-wetness) the rate of consumption of the atomic (metallic) zinc to ionic zinc can be prodigious.

I will now relate the above principles of zinc corrosion and its reactions with other environmental materials, to a galvanizing plus a thin overcoat combination. I will use an epoxy primer and a polyurethane topcoat materials just as examples and because they are very commonly used in this service.

Most polyurethane coatings are not particularly compatible with zinc materials, as the ester linkage in the polyester polyol can be attacked by the alkali zinc corrosion reaction products. This normally precludes putting a polyurethane finish coat directly over galvanizing – for the same reasons that alkyds (oil-based enamels) are incompatible with zinc-based materials. For this reason, epoxy primers are very often specified as a tie coat or primer between the galvanizing and the polyurethane. This brings the high levels of adhesion to a substrate typified by epoxy primers and their excellent resistance to alkali corrosion products to the situation, as well as the presence of large numbers of hydroxyls, which polyurethanes like to bond with.

In theory, this sounds like an excellent system to overcoat galvanizing. However, as usual, the devil is in the details!

In an attempt to keep costs reasonable (considering the general expense of the galvanizing) most specifiers try and keep the film builds of the epoxy primer and the polyurethane down to a practical minimum. Film builds of 40 or so microns of epoxy are commonly specified, followed by about the same of polyurethane, for a total DFT of maybe 80 microns. It is not uncommon to find even less than this has been applied if the coating layers have been thinned to aid flow at low film builds.

There are two things that drive this low film build initiative: the first is cost as the coloured topcoat system is seen as being additional to the expense of the galvanizing and should be practically minimised, and the second is the (incorrect) assumption that the topcoat system is just providing the aesthetics.

At a combined DFT of about 70 to 80 microns, an epoxy and polyurethane coating film is quite porous to water, oxygen and carbon dioxide. If the duplex-coated steel is in a situation where the relative humidity (RH) is frequently quite high, i.e., above about 70%, or the outer surface of the paint film is wet or damp for a reasonable length of time on a regular basis; moisture, oxygen and carbon dioxide will permeate through the film until it reaches the galvanized substrate. Here, the typical reactions between these materials and zinc will occur irrespective of

the presence of the coating system. This will form some of the zinc corrosion products mentioned earlier on the outer surface of the galvanizing. These are typically white, fluffy and voluminous materials with a large collective surface area.

As these zinc corrosion products take up more room or volume than the metallic zinc, they will slowly build up beneath the paint film in the accumulation zones caused by the oxidising zinc atoms. This will start to dislodge the coating film from the substrate by lateral adhesion loss, or undercut. This then tends to stress the film which can cause microcracks in the epoxy (in particular) which can allow for an increased rate of permeation though the paint film. This brings more moisture, oxygen, etc., to the corrosion zone which keeps the reactions fuelled.

There is another significant occurrence and this relates to the more soluble zinc corrosion products such as zinc chloride and zinc hydroxide that may form beneath the coating film. As the first water reaches these materials and dissolves them, a small volume of a high concentration solution will exist on one side of a permeable membrane. This contrasts with a very low concentration on the other side, i.e., on the outer face of the coating layer.

This can set up an osmotic situation where moisture is drawn through the film by an osmotic cell. Note that this inducement or attraction of water through the film to the soluble materials at the galvanized substrate by osmosis is different from the initial stage when it was simple permeation with little or no driving force.

We then have a lot of water, oxygen, carbon dioxide and a bunch of zinc corrosion products all crowding beneath the paint film. This has another damaging consequence: this further increases the time-of-wetness of the galvanizing which is already under attack, because the water and the zinc corrosion products keep the surface in a condition of near permanent wetness, irrespective of the weather or climatic conditions on the outer surface of the polyurethane.

The above process can gallop away with the consequence of each reaction seeming to make the situation somehow worse. In spite of the volume of corrosion material that builds up underneath the film, it is not uncommon to find that the coating layer still stays present, even if it is not intact or bonded. I have seen this sequence of reactions and physical conditions completely consume a full layer of galvanizing in two or three years, where adjacent untopcoated galvanizing is excellent and has only lost a few microns of film build.

Figure 7: Often, it is the horizontal surfaces that are more affected, probably because the time-of-wetness of these is higher than on vertical members. Note the loss of topcoats on the top face of the upper and lower RHS rails, versus the uprights.

The foregoing describes how a coating system that is designed to compliment the corrosion resistance properties and lengthen

the life of a galvanized surface, can be fatal to the entire system. This is partly the reason why so many protective coating suppliers will not guarantee their coating products over galvanizing in the same manner that they will over good zinc-rich coatings such as zinc silicate or epoxy zinc.

It is vital to recognise that not all galvanizing is the same. Over the last few years, there has been a number of architectural and structural products that are made from continuous (strip) galvanized stock. Continuous galvanized steel is not the same as batch galvanized (hot dip galvanized) material. Not only is the form of the zinc and its means of adherence or bonding to the steel substrate different, but it is much reduced in zinc film thickness.

These materials look similar to hot dip galvanized items but because the zinc builds typically range from about 15 to 30 or so microns, they will lose this zinc thickness much quicker in most exposures. These products need the same type and at least the same film builds of coatings as described above, but the surface preparation needs to be modified in some situations as damage right down to the substrate can easily occur by blasting, sanding or grinding.

How to fix it

There are ways to successfully overcoat galvanizing so a good life expectation can be delivered, and in my long experience, these are the rules that must be followed:

- The galvanizing should not be quenched in potassium dichromate or a similar passivating material after it emerges from the galvanizing bath. These corrosion inhibitors that are designed to hold the spangle and bright appearance of galvanizing are impediments to successfully overcoating this substrate. Fresh water quenching or air cooling is best.
- If any oil or grease or other materials are present, these must be correctly removed before surface preparation commences. The normal surface preparation methods of blasting or grinding do not remove these barriers to adhesion.
- Hot dip galvanized surfaces need to be physically roughed to provide a jagged and angular surface profile before being overcoated. The best method to do this on structural steel or metalwork is to use low pressure (about 50 – 60 psi) abrasive blasting, with a fine non-metallic abrasive. Steel grit or chilled iron abrasives can embed and cause dissimilar metal corrosion cells, so should not be used. Shot leaves a peened surface with little increase in surface area, so should also be avoided. The purpose is not to remove any thickness of the galvanizing layer, but simply to roughen the exposed surface, leaving a surface profile of about 20 to 30 microns. Fine garnet, staurolite or crushed limestone are suitable abrasives. Hand or orbital power sanding using non-coated abrasive papers (not free-cut or silicone-coated) can be used on smaller items. Grinding using rotary abrasive or sanding wheels is not preferred.
- The age-old method of weathering the galvanizing to produce a roughened or profiled surface has been discredited and should not be performed. The exposed surface to too prone to becoming ingrained with soluble and reactive materials.
- The best primer to use over galvanizing is a low viscosity catalysed (two-pack) epoxy primer, preferably one that has some zinc phosphate as a corrosion inhibitor. The slower that this product dries (within reason) the better it should perform as intimate wetting of the profiled substrate is paramount. The zinc phosphate helps to suppress the normal zinc corrosion product reactions. Good quality solution vinyls of the USACE (US Army Corps of Engineers) type are also excellent primers over galvanizing.
- Etch primers of most types, particularly the PVB (poly-vinyl butyral) materials, are very problematic and are not recommended for normal use. They are very film thickness intolerant, they are quite sensitive to moisture and must be overcoated within a very precise time or the recoat window shuts.
- The DFT of the full coating system needs to be at least equal to what would be applied to bare carbon steel in a similar exposure. Typically, the epoxy part of the system should be at least 175 – 200 microns. Polyurethane and similar finish coatings are quite permeable to moisture

Mark B. Dromgool, Managing Director, KTA Tator Australia Pty Ltd

Mark Dromgool is the managing director of KTA Tator Australia Pty Ltd, based in Melbourne. He has been continuously active in the protective coatings industry for 39 years. Mr Dromgool's experience includes about ten years as a coating application contractor and about seven working for two of the largest protective coating suppliers in Australia and New Zealand. In 1994, he formed KTA Tator Australia as a protective coating engineering, inspection and consulting company.

Mr Dromgool is a long-standing member of SSPC and NACE, and is former president of the Blast Cleaning and Coating Association (BCCA) of NSW. He has written and published many papers on coatings and linings and has lectured widely at local and international conferences. In 1996 and again in 2007, Mr Dromgool was the recipient of the JPCL Editor's Award for papers entitled *"Maximizing the Life of Tank Linings"* and *"Epoxy Linings – Solvent-Free But Not Problem-Free"*, respectively. In 2006, Mark Dromgool was awarded the John Hartley Award for Excellence by the BCCA of NSW.

Mr Dromgool has qualifications as a mechanical engineer; is an ACA Certified Coatings Inspector; a NACE-accredited Protective Coating Specialist; an SSPC-accredited Protective Coating Specialist and a NACE-Certified Coatings Inspector – Level 3.

and other molecular materials and their DFT should not be counted in the part providing permeability resistance.

- Epoxy high build coatings that contain MIO (micaceous iron oxide) pigments are very effective as they generally provide a higher resistance to permeation per micron than other epoxy materials.
- A gloss polyurethane is preferred over a semigloss or flat polyurethane as it sheds dirt better and dries faster, allowing a shorter time-of-wetness.
- Avoid any situation where water ponding or poor drainage can occur. Even with properly prepared and overcoated galvanizing, ponding increases the risk of breakdown.
- A typical, reliable and well-proven system would be:
  - Degrease thoroughly using solvent and fresh water.
  - Lightly abrasive blast using fine garnet and fully dust off.
  - Apply 50 microns DFT of a low viscosity zinc phosphate-inhibited epoxy primer.
  - Apply 150 microns DFT of a high build, MIO-filled atmospheric-grade epoxy.
  - Apply 60 microns DFT of a high build acrylic-modified polyurethane gloss finish.

Final thoughts and advice

Zinc-rich coatings such as epoxy zinc and zinc silicates have quite a number of advantages where topcoating is to be performed, as these do not suffer most of the problems described above.

Always seek professional and reliable advice when preparing coating specifications, especially for overcoating galvanizing and similar substrates.

Do not allow subcontractors and suppliers to amend or adjust any surface preparation or coating system specified for over galvanized substrates, however well-meaning their intentions may be. It is the usual practices that have been followed for years that are as wrong now as they were then.

New App lifts the lid on stainless steel's lower life cycle costs

SASSDA Executive Director, John Tarboton.

Johannesburg, 15 August 2016 – One of the biggest obstacles to the specification of stainless steel in certain applications, is the misperception that it's more expensive in comparison to other initially cheaper options. In the short term, that may be the case but a new world-first App from the Southern Africa Stainless Steel Development Association (SASSDA) is set to lift the lid on the 'bigger picture' – namely stainless steel's ability to ensure far lower overall life cycle costs (LCC).

The benefit of the newly launched App – which is now available on the Google Play (Android) Store and will be available in the Apple iStore by the end of the year – is that it allows for the real-time calculation of the LCC of stainless steel via an easy to use, pre-programmed calculator. This requires the entry of key top-line data, followed by the simple click of a 'Calculate' Button which in turn generates a breakdown of the relevant costs and the ability to e-mail this to the relevant recipients.

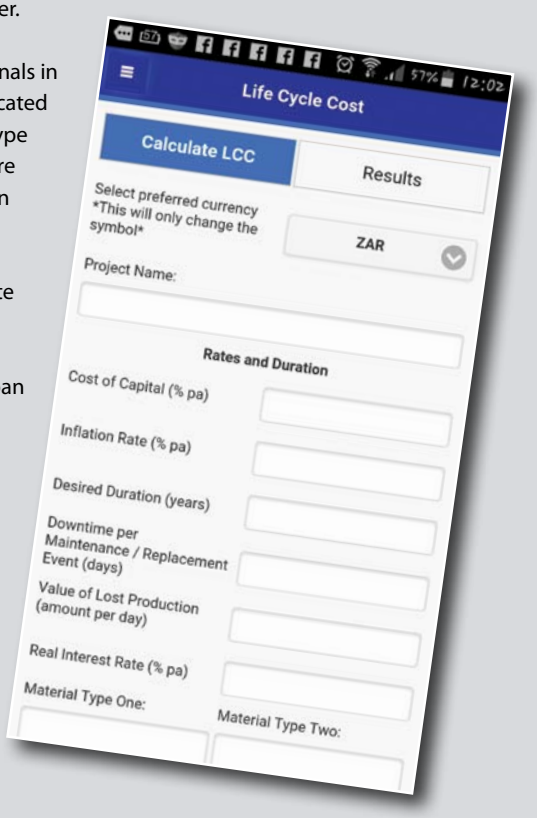
SASSDA Executive Director John Tarboton elaborates; "The App was created to assist engineers to calculate total LCC using the standard accountancy principle of discounted cash flow, so that total costs incurred during a life cycle period are reduced to present day values. This allows a realistic comparison to be made of the options available. In terms of material selection, the APP also enables potential long-term benefits to be assessed against short-term expediency."

He adds that many months have been spent working out the correct formulas that now form the backend of the App, which has removed the burden of this type of time-consuming calculation from the end user.

"This will prove invaluable for professionals in the field, wanting to bypass the complicated process normally associated with this type of calculation that most professionals are unfamiliar with; unless they also have an accountancy qualification!

"In this way we're also hoping to educate the market on the inherent benefits of stainless steel which include minimal maintenance, a minimum 60-year lifespan and significant 'green' benefits," adds Tarboton.

The SASSDA Life Cycle Cost calculator is also available via the following link: http://sassda.co.za/the-life-cycle-costing-of-stainless-steel for non-Android phone owners.



Issued by: *MediaInk Communications on behalf of the Southern Africa Stainless Steel Development Association (SASSDA)*

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Worksite safety 101: A review

Authored by Gerard A. Marley and Heramb Trifaley

Falls, explosions, chemical poisoning… it's the darker side of inspection you hope doesn't happen.

But after spending years in the inspection field, things can get routine. It's easy to take jobsite and equipment hazards for granted, and that's when accidents happen.

In this article, we'll take a new look at the work environment and the inspector's average day in a step-by-step breakdown of common work situations. It is in no way a complete guide, and it is your responsibility to have proper safety training.

Work environment hazards

Sometimes the job site itself poses a hazard. Common safety issues to watch out for include cell phone usage, slip or trip hazards access/egress and confined spaces.

Cell phones pose a major distraction on site. Inspectors have walked off scaffolding and bridges and into hazardous situations while preoccupied with their phones. Cell phones are not intrinsically safe, and a battery spark could ignite a solvent or particulate rich environment. It is important to be aware of your surroundings while using cell phones and use them only when safe.

The equipment placed by the contractor and equipment previously installed by the owner can lead to slip and trip hazards. Hoses and power cords are frequent culprits of this type. If the work is performed at height, there could be fall hazards while conducting the inspection. The necessary fall protection and work-positioning equipment should be used by the inspector.

Access and egress concerns to and from the worksite for a confined space are site-specific. The confined space may be at heights or underground, making it difficult for an inspector to access the work area. Common examples are going up water towers and down manholes. Access systems such as scaffolding also pose a major threat. The scaffolding may be incomplete or have changed since the last inspection. Familiarization with the access system and general plan of the structure may minimize these hazards.

Confined spaces or enclosures require special attention and often site-specific training. Boilers, ballast tanks, storage tanks, process vessels and weather controlling containment are a few examples of confined spaces and enclosures. Each site has its unique hazards, and a safety professional should be the one to advise you on each site's risks. The facility owner should help provide guidance on the training requirements needed for their facility.

Enclosures and confined spaces may have limited lighting, making it difficult for the inspector to safely navigate and inspect the work area. The common standard for illumination of enclosures or confined spaces is SSPC Guide 12.

The structure of the confined space can itself be a hazard. Some sites have longitudinal and transverse beams to navigate, steps, uneven walkways and tight corners, to name a few.

Airborne dust and vapours in confined spaces are often the reason for flash explosions. Proper ventilation and energy/spark isolation are important elements while working or inspecting inside a confined space.

Environmental readings

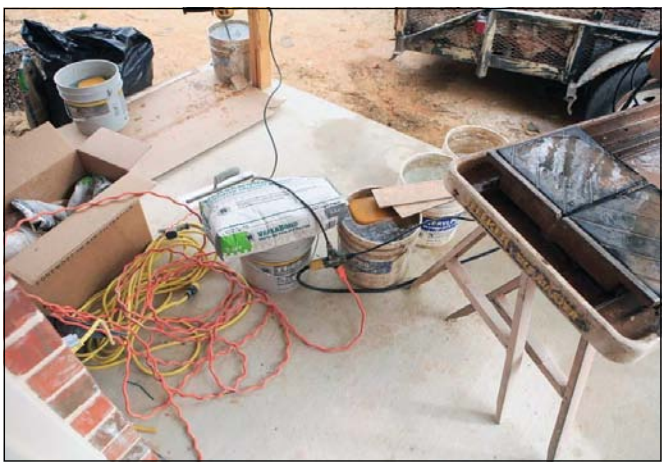
The first thing an inspector does each day is take environmental readings. The sling psychrometer is a hand held tool commonly used to measure relative humidity and dew point. The tool is simple to use, but the glass thermometers inside (typically filled with alcohol or mercury) can break and cause cuts, punctures or toxicity issues for the inspector.

Electronic hygrometers are preferred by the inspector for gauging environmentals requiring less calculating, but are not always intrinsically safe, i.e. explosion proof. An electric spark from them can cause a fire or explosion in the solvent-rich environments often found during the preparation, application and curing of coatings.

Non-visible contamination testing

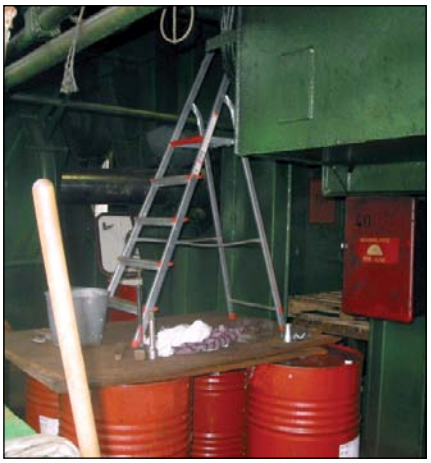
The next thing an inspector does is test for surface contaminants. The Bresle Patch test for salts is not difficult, but does

Work place hazards.



Slip or trip hazards.

Accessibility hazards.



Accessibility hazards.

present a hazard for the inspector. The test uses a hypodermic needle that can cause puncture wounds if the inspector is careless or becomes distracted during the testing process. The puncture could lead to infection or a communicable disease.

Conductivity testing

Electronic conductivity test equipment is used in conjunction with the Bresle Patch. It too is not always intrinsically safe, and a battery spark could lead to fire or explosion in a solvent-rich environment.

Chloride testing

The sleeve test and Kitagawa tube is a simple test for detection of chlorides often carried out by the inspector. During the process of the test, breaking glass tips off both ends of the Kitagawa tube presents an opportunity for the small glass pieces to injure eyes. The larger portion of the tube also has an irregular and sharp surface that could cause a cut or puncture wound.

Ferrous ion testing

Testing for ferrous ions is extremely easy, but requires caution. The test uses an absorbent patch treated with a chemical that detects the presence of ferrous ions. The chemical (5% Potassium Ferricyanide) may induce diarrhoea if ingested. Precautionary measures such as wearing rubber gloves are always necessary.

Residual testing after SSPC SP1: Oil and PH

The water break test for residual oil is simple and often used when there is too much natural light for UV equipment to identify residue. However, water can cause the surface to become slick. If the test is performed at freezing temperatures, ice can also make the surface slippery.

Using a black (UV) light is a method of testing for residual oil. The light puts out a beam of 350 NM, a wavelength that can cause serious eye injury or blindness. The UV

Bresle Patch test.

Sleeve test with Kitagawa tube.

Ferrous ion test.

Sling psychrometer with two glass thermometers.

unit requires the use of a filtering eyewear. As a precaution, never look directly into the light source.

PH testing for residual soil is common using the previously mentioned electronic equipment or Bresle tests. The hazards of the equipment or test have been listed previously i.e. puncture wound or intrinsically safe electronic equipment.

Many SP1 cleaning agents can also be hazardous. The materials must accompany a Safety Data Sheet (SDS) and inspectors should be familiar with the health hazards. As a standard measure, SDS is an OSHA requirement for any material on the jobsite.

Surface inspection after preparation

During the cleaning process there is a tremendous amount of dust and debris created and warrants appropriate respirator protection. The SDS should be consulted to identify the OSHA required PPE protection.

SSPC SP 2 / ISO St2 or St3 hand tool cleaning

Hand tool cleaning instruments are seemingly easy to handle and not thought to be dangerous. However, they do warrant attention. One frequently used tool is a dull putty knife, used to verify acceptance under different standards. Scraping steel on metal surfaces can potentially create sparks that can be dangerous in a solvent-rich environment. Also, brass hand tools are not as tough as steel and are more easily breakable during cleaning; such sudden breakage may cause injuries.

SSPC SP 3 / ISO St2 or St3 power tool cleaning

Inspectors often perform in-process inspection of this step in the surface cleaning procedure. Use of the power tools and testing with a dull putty knife usually create hazardous airborne debris. As such, it is essential to use appropriate PPE such as a dust/vapour mask, eye protection and protective clothing.

NACE/SSPC and ISO abrasive blast cleaning

Abrasive blasting operation is capable of producing high sound levels ranging between 110-125 DBA. Hearing loss is only one of the hazards posed by such high sound levels. If the inspector is working in the vicinity of blast operations, it is imperative for the inspector to use hearing protection and any other required PPE.

After a contractor conducts blast cleaning, an inspector examines the surface and marks any areas requiring touch up work. Inspection and markup is usually performed during contractor breaks and lunches. The time frame for inspection is limited

About the authors...

Gerard Marley "Gerry" has 28 years in the coating's industry. He is a member of NACE, SSPC and IUPAT "International Union Painters Allied Trades". He started in the application field and is currently teaching NACE CIP 1 and 2 inspection courses worldwide. He is also an SME for applicator training program at NACE. He is also doing coating survey's, consulting, and inspection work that allows him to travel. In his spare time he works on his farms in Illinois, raising cattle, bees, and grain.

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and the inspector may often be rushed in performing their duties.

Inspection during this stage presents hazards associated with contractor's equipment; i.e., hoses, access machines and pressurized equipment. The presence of airborne particles left from blasting requires the appropriate PPE.

Rework on the abrasive blasted area

Contractors sometimes want to finish any necessary rework as soon as possible so that they do not miss the coating application window. The inspector must identify the rework and inform the contractor to start rework only upon completion of the inspection process. Inspectors often do not wear abrasive blasting suits, and hence starting abrasive blasting while the inspector is in the vicinity may pose physical hazard.

Anchor profile readings

Anchor profile readings are taken as soon as possible every day to measure surface roughness. The battery-operated testing equipment may not be intrinsically safe and may ignite vapour or particulates. The SDS should always be available to inform you of proper PPE requirements. Frequently, respiratory protection is required for the inspector taking profile readings.

Paint application

Inspection during coating application is an ongoing process, often requiring the inspector to be present during application. Each type of coating poses a different hazard, either respiratory, injection or ingestion. The SDS is the first place to look for PPE requirements needed for the products being applied.

Hazards from pressurized equipment, hoses, spray guns, heated hose lines and other application equipment can pose a great threat to inspector safety. Inspectors should be self-aware during equipment operation and exercise utmost care during the application process.

Dry Film Thickness (DFT) and Wet Film Thickness (WFT) readings

Taking DFT and WFT readings have their own hazards. The possibility of toxic levels of solvent vapour remains, and the SDS should be consulted for PPE requirements. Again, using cell phones is hazardous in this potentially explosive environment.

Holiday testing

Inspecting coatings for pinholes and coating defects (i.e., holidays) requires the use of low and high voltage testers that are not intrinsically safe. They pose a threat of electrical sparks (and potential fires or explosions) and severe electrical shock during testing. Using this inspection equipment requires PPE that may not be needed for other inspection duties.

Destructive testing

Some destructive tools use batteries to illuminate a built-in magnifier. Inspectors should be aware explosion hazards associated with such tools.

One well-known destructive testing tool is the paint inspection gauge. The inspector must obtain written permission before administering the test. The cutting tip of the tool as it comes in contact with steel has the potential to ignite sparks. While making a cut with the gauge, using excessive force may cause the tool slip and cause injuries.

Another tool is the pull-off adhesion tester. Some models use a hydraulic or pneumatic pump in order to create a vertical pull on the dolly. In case of excessive pressure, there is always a chance of a hydraulic burst creating oil spill, which itself is a great hazard. Electronic models pose the threat of electric sparks.

Conclusion

Hopefully this has been a helpful review of inspection hazards. We can only suggest some areas to look out for; it is inspectors who are ultimately responsible for their personal safety and to know how to safely operate equipment. The manufacturer's guidelines for an inspection tool are a good place to start learning, and the inspector should also be trained in the safe operation of equipment.

Disclaimer: This article is provided only as a guide for situational awareness. It is your responsibility to get proper training from a "Safety Training Professional".

Corrosion management in a challenging economy

The nature of today's working environment is changing as budgets become more constrained and the political landscape transforms around the world.

Whatever the economy or politics of a country, corrosion will be an economic threat to industry and the wider community, as well as a physical threat to infrastructure and personal safety. While there are news reports of oil pipeline ruptures, sewer explosions or sink holes appearing after a burst water main, the effects of corrosion usually take many years to appear. Effective management or prevention of this insidious threat is essential to minimise its impact.

A report released this year by NACE International highlights the massive cost to industry but also indicates the savings that can be made through effective implementation and utilisation of available corrosion prevention technologies and processes. It has been estimated that, globally, more than seven per cent of GDP each year is spent on corrosion mitigation and repair. For Australia, in 2013, this equated to more than $20 billion.

There are many unseen costs that result from unmanaged corrosion. The most common being the loss of production resulting from an unplanned shutdown. Less obvious costs are unbudgeted capital expenditure to replace machinery and equipment or the damage to a company's reputation following a pipeline rupture or similar safety issue.

In response to budget constraints and the rising cost implications of corrosion across all industries, asset owners and managers look to achieve a good return on their investment. However, the changing dynamics of the economy mean that companies offering corrosion management services have to convince their customers of their value. "Asset owners expect a better ROI on the money they spend on maintenance," said Dean Ferguson, Materials Engineer with Infracorr Consulting and Senior Vice President of the Victorian Branch of the Australasian Corrosion Association (ACA). Infracorr is a leading engineering consultancy specialising in rehabilitation and durability solutions for concrete and masonry infrastructure.

Applying a protective coating to the roof of a sports complex.

The Australasian Corrosion Association (ACA) works with industry and academia to research all aspects of corrosion in order to provide an extensive knowledge base that supports best practice in corrosion management, thereby ensuring all impacts of corrosion are responsibly managed, the environment is protected, public safety enhanced and economies improved.

"Budgets for asset maintenance are never large enough to cover requirements. Coatings are seen as passive, so structures are often left to fend for themselves until corrosion damage is severe," said Aaron Davey, Director of Bastion in New Zealand. "When coupled with the wrong coating, subsequent costs can appear far sooner than otherwise expected."

Bastion has been providing innovative leadership to engineering, construction and maintenance projects throughout NZ for nearly 10 years, primarily with public infrastructure organisations and manufacturing industries.

"In the past, short-term, low cost solutions were what owners and operators were looking for," said Sean Ryder, senior engineering consultant with Phoenix Solutions in New Zealand. "Today we are able to discuss the benefits of looking at the 'whole of life' asset costs." This holistic approach takes account of construction and

Time and money savings can be achieved if decisions about maintenance are made during a structure's design and build phases.

projected maintenance costs of a project. If it is possible to incorporate materials and processes into a design that results in reapplying surface coatings every 15 years instead of 10, there are savings to be gained.

Owners of high-value assets must understand the cost implications of ignoring the effects of corrosion. There are many advantages of planning for corrosion control and mitigation, two of which are that the life of an asset can be extended and maintenance time and costs reduced.

According to Ferguson, there is often inadequate time given over to the design phase. "Companies often rush this and find errors later that could have been avoided," he said. "Durability is often viewed as an afterthought rather than a value add."

"We understand that money can be tight, but it is better to consider how to look after an asset when it is designed and built,"

Many companies, including Mattioli, have a reputation in the industry as protective coating innovators.

Protecting the metalwork around a water storage facility.

said Gianni Mattioli, Director of his family-owned surface coatings business that has been providing a complete coating service to a diverse client base across Australia for more than 40 years. The company's focus on innovation, quality, workmanship and safety has seen Mattioli achieve an unsurpassed reputation in the industry as innovators in protective coatings.

Monitoring the impact of corrosion on any type of structure is a critical aspect of ensuring asset integrity. A key way of minimising corrosion is to employ appropriate protection technologies. "Proactively testing and inspecting gives a clearer understanding of where to spend limited resources on maintenance of assets," said Rob Francis, of R A Francis Consulting Services. Francis has more than 40 years' experience in metals, materials and corrosion, especially regarding protective coatings.

Working 20 storeys above the ground adds to the challenges of protecting structures from corrosion.

"Asset owners often prefer to put off maintenance until it is too late," said Ferguson. "Everyone knows that it is cost effective but rarely have the budget to implement integrated design and servicing program."

However, practitioners have noticed a gradual trend toward asset owners recognising the benefits of maintenance planning. "Since starting in the industry on the 1990s, I have seen a shift in attitude by asset owners," Davey said. "More are appreciating the wisdom of doing it right the first time."

Ryder supported this opinion, stating that he had "noticed quite a significant increase of the awareness of asset owners as to the benefits of designing for durability; they are more and more taking a long-term view of asset protection."

It is usually government bodies and larger companies that take a lead role when new business concepts are implemented, but it can still take some time for there to be a 'ground swell' of acceptance. "Once larger government agencies start doing it, the uptake flows down through other bodies and commercial companies," Ryder added.

Best practices for construction and servicing operations have been changed and adapted to reflect the latest health and safety legislation and regulations. These have also flowed through into the quality control of a project. Asset owners have been forced to consider how things will be maintained in order to keep workers safe while carrying out repairs or applying a protective coating.

The changes in OHS legislation are also being incorporated into asset management plans. The safety aspect of designs are being viewed as part of the overall maintenance strategy. "If it is difficult to get up to an area of a structure to re-apply a protective coating, it would have been better to design it with easier access," said Ryder. If, when it is built, there are few constraints on the access to a structure or the equipment to be maintained, it is possible to reduce the frequency of servicing.

"We have been on some projects where a building may look nice and do its job, but there may be overhangs and lips," said Mattioli. "We as contractors have to access these to do our job but there has usually been little thought of how to get into these areas. It is even worse if the job is 20 storeys above ground."

As an illustration, working on the structural cross members of an offshore platform or transmission tower in a remote location requires a unique combination of skills, but also additional safety precautions. Technicians need to have both the appropriate corrosion qualifications and abseiling experience.

In order to effectively and compre-hensively explain the benefits of incorporating maintenance planning into the design process, companies and practitioners in the industry must ensure they understand all the latest products, technologies, processes and legislation. "We devote lots of time to staff training and education" said Mattioli. "We feel it is important for all members of our team to continue to learn about the new materials, new techniques and new training methods."

Advances in technology and the spread of the Internet means that the amount of

information that is readily available to designers, builders and contractors is vast. Companies are finding their staff are willing to research best practices and how to use new materials. "There is a new generation coming through with a focus and interest in doing a job well using the best technology and materials," said Davey. "With the amount of data and the ease of access to it via online sources, it is easy to achieve excellence these days."

As the manufacturing industry restructures, some companies are taking advantage of workforce changes. "There are challenges to the economy and some sectors are hurting more than others," Mattioli stated. Some manufacturing workers have a certain mindset in terms of precision and understanding the planning and steps that need to be taken to successfully apply a protective coating. "It has been surprising that we have had great success retraining auto mechanics as applicators," he added.

An added benefit of planning for sustainability and designing projects to require minimal maintenance is a reduced impact on the environment. "If you can maintain it effectively, you do not need to replace an asset as often which therefore has an environmental benefit," added Ryder.

One area where Phoenix Solutions is expanding its work is reusing materials onsite, especially for remote communities and island nations in the Pacific region. One scheme the company is associated with involves taking polymer waste and incorporating it into a standard concrete matrix. The polymer provides additional durability for assets that require lower structure strength such as footpaths and buried septic tanks.

"A major consideration is ensuring that a successful mixture is repeatable," said Ryder. "We have to be careful to ensure that there is consistency in the treatment of the polymer waste." This recycling of waste polymer provides strength and durability to tourism infrastructure and reduces the cost of the works because the amount of steel rebar that has to be shipped to remote locations is reduced. There is an additional benefit in that it minimises the amount of waste material that is shipped from the location or burnt.

"Explaining the financial drivers is usually simpler as the results are easily measured now," Ryder stated. "However, as time goes on, there will be more and more measurable results of the environmental benefits which will encourage clients to do more design for durability."

The ACA is a not-for-profit, industry association, established in 1955 to service the needs of Australian and New Zealand companies, organisations and individuals involved in the fight against corrosion. The vision of the organisation is to reduce the impact of corrosion.

About the Australasian Corrosion Association

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

http://www.corrosion.com.au

Wesley Fawaz, Executive Officer of the Australasian Corrosion Association

Wesley Fawaz is the Executive Officer of the Australasian Corrosion Association. He is responsible for the implementation of the strategic direction and management of daily operations of the organisation. Wes holds a Bachelor of Business majoring in management, marketing and HR.

An Association Management Professional, Wes provides support and advice to the ACA Board, fostering strong links between the Association, its members and industry to ensure that they continue to minimise the impact of corrosion in the wider community.

From the KETTLE

Because corrosion control of steel by hot dip galvanizing plays such an extremely important role for specifiers and end-users in their specification choice, it was proposed that we highlight and demystify a number of surface conditions over a series of editions that bear very little influence of the coatings durability seen both during the initial inspection and also after years of being exposed to a particular environment. See surface condition F4 and F6 (Condition F6 unfortunately must either be repaired or stripped off, the steel abrasively blasted and then regalvanized or painted).

Legend

#1 As the life of a zinc coating is proportional to its thickness, a thicker coating will proportionally outlast a thinner one, however, a thicker coating can be more prone to mechanical damage, when handled inappropriately.

#2 All passivation products including sodium di-chromate will be excluded by the galvanizer when he has received written instructions that the hot dip galvanized steel is to be painted.

#3 While double dipping is occasionally seen to be necessary due to a limited bath size, the galvanizer must inform the customer that this practice can increase the propensity for distortion, before he commences with the work.

#4 While the galvanizer can lower the zinc temperature and shorten the immersion time to limit coating pickup, however, due to increased costs to himself, he is not obliged to do this and if necessary will recover the cost from the purchaser. Insufficient vent, fill and drain holes will lengthen immersion times.

Hdg Hot dip galvanizing **A** Accept **R** Reject **N** Negotiate **C** Clean **REP** Repair **SS** Significant surface.

F4

DESCRIPTION:
Rough coatings caused by steel surface conditions prior to hot dip galvanzing.

CAUSE:
Rough surfaces, typical of coatings on corroded steel surfaces, can be hot dip galvanized satisfactorily. The coating will, however, reflect the texture of the substrate. Other causes of rough surfaces include uneven cold working, over pickling, a high galvanizing temperature and / or extended immersion in the molten zinc. **#1**

EFFECT / REMEDY:
The rougher surface shown ungalvanized on the right will produce a thicker coating, resulting in a longer service life.

ACCEPTABLE TO SANS 121:
A

Depending on customers use.

Galvanizer must comment prior to galvanizing the steel.

ACCEPTABLE FOR DUPLEX AND ARCHITECTURAL FINISH:
A / R – (D & A)

Depending on customers use.

Galvanizer must comment if possible prior to galvanizing the steel.

Coating thickness 668μm.

Should previously heavily rusted steel not be comprehensively abrasive blasted prior to hot dip galvanizing, small bare spots can result. While the resultant coating will be extremely thick and tenacious, aesthetically it will be less pleasing.

Rough coating appearance.

Rough coating appearance.

Coating thickness 363μm.

Surface appearance of plain carbon steel likely to achieve a rough coating appearance.

F6

DESCRIPTION:
Cracking, flaking or delamination of coating. No adhesion of zinc to steel surface. No iron / zinc alloy layer. Thick, rough coating.

CAUSE:
High phosphorous content in the steel, greater than 0.02%, could cause the entire coating (no residual Fe/Zn alloy layers) to crack and delaminate partially or fully from the steel.

Coating cracking.

Coating flaking.

F6 continued...

High phosphorous content in steel can result in a "tree bark" surface finish. See also F8.

EFFECT / REMEDY:
Use a steel that has a phosphorous content of lower than 0.02%, ideally 0.01%.

Insist on an accurate chemical analysis certificate from the steel supplier. Steel with a phosphorous content of >0.04% is virtually impossible to hot dip galvanize successfully.

ACCEPTABLE TO SANS 121:
R

Customer to refer to steel supplier.

ACCEPTABLE FOR DUPLEX AND ARCHITECTURAL FINISH:
R

Customer to refer to steel supplier.

See the Association's Architectural Check List #4.

Thick coating – 632μm.

Very little (10.2μm) residual Fe/Zn alloy layer.

Thick coating – 583μm.

Very little (24μm) residual Fe/Zn alloy layer.

A tribute to Bryan Gordon Callaghan

By Greg Combrink

In 1989 I was appointed as the Officer-in-Charge of the Navy's Materials laboratory (Mat Lab). At the time they had been negotiating with the CSIR to appoint an interim Lab Manager for a three year period who was to find someone like me to develop into becoming the MAT LAB manager. You could say I was in the right place at the right time but as they had seemingly found me on their own account the thought crossed their minds that they no longer needed the services of the CSIR for this anymore and I alone could carry the burden. Well to make a long story short I felt differently and proceeded to lobby the powers that be to continue with the scheduled CSIR programme. Luckily sanity prevailed and the contract with the CSIR went ahead. The man chosen to represent the CSIR in the SA Navy Mat Lab was Bryan Gordon Callaghan.

The first time I met Bryan was early in 1990 when during a lobbying trip to Pretoria (Naval and Defence HQ) I made an appointment to meet with Dr Callaghan at his CSIR office at Building Science, Scientea. I, being a youngster did not know what to expect as by that time I had heard about his impressive work in the field of corrosion and was quite intimidated by the mere fact of meeting this man with such a wealth of knowledge and experience. I could not have had a more wrong idea of what to expect. Dr Callaghan immediately welcomed me into his office and put me at ease and so began a long relationship with my mentor for the next 26 years of my career.

18 months later Bryan was appointed as the CSIR representative at the Mat Lab and was down in Simon's Town sharing an office with me and several staff members. In those days the Mat Lab was in a small side building of the Electrical Workshop in the Naval Dockyard and I recall Bryan looking out of the office window and saying that we should look out for a larger and more suitable building... one whose roof did not leak. So began my mentorship.

The Mat Lab did not only deal with corrosion matters but also measuring of potentially hazardous environments, microbiology, electroplating, chemical matters such as deionizing water, water treatment, anodizing, coolants, fuels and oils, coatings and of course metallurgical matters and non-destructive testing matters and I was utterly amazed at how deep Bryan's knowledge base was as he always had some idea of what to do and how to approach a problem. In our early days together in the Navy the MatLab was not very well used by the Navy units but after three years of hard slog and building confidence in the service, it had grown massively. Much of this was due to the presence of Bryan in the Mat Lab.

Bryan and Greg, 10th July 2015, at Bryan and Pat's home – Peers Village, Fish Hoek.

Bryan was not afraid to get his hands soiled and promoted the approach of going out to site, observing, touching, feeling, smelling and climbing into and onto things to get a better view and understanding of the problem and the related processes involved. I have fond recollection of us climbing into the emptied (and gas-freed) fuel tanks of submarines and ships double bottom void spaces to look at pipes and hull inner surfaces and support beams etc. His approach was "let's go and look".

In the 90's the SA Navy procured a ship from the Ukraine and it was our job to advise the project team on anti-corrosion measures that needed to be done and also to have the ship converted to Navy Grey: The two of us kitted out with full safety harnesses and little containers of paint thinners and clothes climbed up to the top of the internal chambers of the on-board centre monkey island cranes, opened the hatch and leaned out high above the deck (about eight stories high... yes with safety harnesses) to rub the thinners onto the existing organic coatings so as to get a good idea of what coatings had been used so that it could be over-coated.

At other occasions we climbed up onto water towers, transmission aerials, down into fuel tanks, into void spaces and into dry-docked caissons and on many occasions into such small spaces that looked impossible to fit one person, not to mention two.

On other occasions we had foreign navy visits and we as the Mat Lab were called in to provide advice on materials, welding repairs, anti-corrosion practice and survey work on French, British, Indian, Taiwanese and several other navies' ships that popped in to Simon's Town from time to time. The confidence in the services of MatLab and of course my staff and I would never had happened as quickly as it had had it not been for the expert and down to earth guidance of Bryan.

Working to Bryan's time scales, the new MatLab was officially opened by Vice-Admiral Aart Malherbe in early 1994. It was a momentous occasion that would not have occurred so soon had Bryan not been our mentor and guide.

At the end of the three year contract, Bryan being 60 at the time officially took retirement after spending almost 40 years working in the field of corrosion and much of it for the CSIR. In his early days he worked with Commander WJ Copenhagen ("Copey" as he was affectionately known and who is regarded by many as being the father of corrosion in South Africa). Copey who also worked for the CSIR, was one of the highest ranking civilian force officers in the Navy and Bryan used to tell me about his antics... in the early days the CSIR had to test all the alcohol that was imported into South Africa. As only a small amount was needed from each bottle for testing purposes, Copey had devised a method of sticking a syringe needle through the cork thus effectively leaving the rest of the bottle virtually intact. Bryan would say when visiting Copey at his home you could ask for any brand of liquor and in most instances you would get it.

Another of Bryan's sayings was "Don't Play Silly Buggers" and when he said that to us we knew better than to deviate from his guidance... He knew exactly where "playing silly buggers" would take us as he had done it before and experienced the outcome and I learnt that when looking at damage caused by corrosion it wasn't enough to purely understand the corrosion process but one had to also take other aspects into account such as costs and accessibility for maintenance and repair. In terms of corrosion a design without access was a bad design. He would consider an issue and understand that unless the proposed solution was a practical one it was never likely to be implemented. Playing silly buggers often meant proposing a possible but totally impractical and costly solution to a corrosion problem. We soon learnt.

Another thing about Bryan was that he always seemed to know where to go to find or confirm the answer, if it wasn't "Bones" at the Water research unit of the CSIR in the Stellenbosch, it was Eric Duligal or Tony O'Donell in Joburg or a myriad of other people or organizations such as the SASSDA or the Copper Development Association. He always had an idea of what could possibly be the cause of a corrosion problem. In 1991 Bryan was involved as a founding member of the newly established Cape Branch of the Corrosion Institute of Southern Africa, convincing several of us to come on board and the branch was soon set up under his chairmanship for the first two years. This brought a new dimension to the Cape with youngsters like me able to meet and network with the more experienced people in the Cape (and from elsewhere).

When the CSIR's contract with the Navy ended, Bryan settled down to "retirement" in Fish Hoek" but after having convinced the Navy to second me for further corrosion studies in Manchester UK, he came back for the 16 month period to guide my second in command just as he had done with me. Upon my return to the RSA I often visited him at his home in Nelson road to bounce things off him. He was a true mentor and role model always freely giving of his knowledge and experience and this taught me to always try to plough back into the system.

Although he specialized in atmospheric corrosion and published several papers and research results on the subject, he had an extremely broad knowledge and experience on a far wider corrosion basis and this lead to him being referred to by many fellow corrosion specialists as South Africa's "Mr. Corrosion". One of Bryan's most significant studies, "Atmospheric Corrosion Testing In Southern Africa", was published after 20 years of testing materials and coatings and included the first Corrosion Map of Southern Africa.

Bryan was a Fellow and subsequently an Honorary Life member of the Corrosion Institute of Southern Africa. He is also a CorrISA Gold Medalist.

After I left the navy to further my career, I often consulted him about the way forward and he freely advised me. I will never forget his mantra for dealing with projects and tasks of "OB2T" – "On Brief, On Budget and on Time!" He also used to joke that as a corrosion engineer he visited the best hotels in the world... and then hastily added "to inspect their corroded plumbing and toilet systems!"

Bryan was born in East London on 23rd January 1934. Several years ago Bryan was diagnosed with pancreatic cancer. He regularly went for treatment at Groote Schuur and survived around six years before passing away on 25th July 2016.

He leaves behind his wife Pat, three children (Hillary, Peter and Brenda) and four grandchildren. He was not just my mentor and a role model but my very good friend and I miss him.

Manager's Message

September 2016 and the AGM is upon us. We have seen so many changes over the past year, and we are about to welcome in a new council for 2016/2017.

We have had to make some difficult decisions, one being not hosting the Annual Awards Dinner in Gauteng this year, but we are so very excited to have the awards evening held in conjunction with our Cape Town Annual Dinner. We have also had to postpone a number of training interventions due to extremely low numbers. But this seems to be steadily improving.

Our 2017 Training Schedule is ready and can be found on our website.

Change is good and working closer with our regional committees has been such a positive experience. I look forward to the new relationships and to seeing the Corrosion Institute grow with leaps and bounds.

Our Accreditation is almost complete and the final submission is due in at the beginning of October 2016. This can only be a positive thing moving forward and will open so many new doors for us in the future.

Over the past few months we have welcomed a new team member into our folds. Jenny Taylor will be our Secretary and Administrative Co-ordinator, working closely with SAQCC. Thobi will be leaving us for a while as she will be adding to her family in October. Desiree Armugen will be the new friendly voice answering your calls for the next four months.

AfriCORR proved to be very successful and plans for AfriCORR 2018 are already underway.

Remember to visit us at our monthly Technical evenings, regional dates can be found on our website. Should you be interested in presenting at a Technical evening, please contact the Corrosion Institute for more information.

Until next time, keep well.

Lynette Van Zyl

Comment – Chairman of the Western Cape

The Western Cape region held their AGM last month and we had the honour of having a few out of town guests attending including Edward Livesey, the current President of the Corrosion Institute, the immediate past president Bruce Trembling as well as Gert Conradie, a NACE instructor. It was a very informative meeting and a lot of the queries that we as a region had were addressed by Edward. As a committee we appreciate the commitment that Edward and the National Executive Council have made in involving the regions more closely and his visit went a long way in contributing to this. We hope that this will become an annual occurrence. We welcome Thinus Grobbelaar to the new committee and we bid farewell to Simon Norton. Thanks Simon for your contributions to the committee and to the Corrosion Institute as a whole – much appreciated.

We look forward to hosting the Annual Awards Dinner at our end of year Gala Dinner. As far as I am aware this is a first for the Corrosion Institute and by involving the regions so much more closely will have a significant impact on the morale of the Western Cape and KZN regions and the inclusiveness that we feel.

A very well run AfriCORR took place in July. As a region we would like to see it being more targeted at industry and to try and involve more companies from around South Africa.

Recent presentations included the very well attended Development of Soluble Salt Contamination Measurement by Craig Woolhouse of Elcometer where we had over 50 attendees. As part of our AGM we also watched a very interesting documentary about the The Bhopal Disaster in India and Toprope presented a very interesting presentation entitled "Rope access the alternative solution".

We have the upcoming Expo to look forward to in October and then the finale for the year will be the Annual Gala dinner.

Hopefully see you at Kelvin Grove for one of our functions soon!

Yours in Corrosion

Graham Duk

I wish to acknowledge the input of our committee, Tammy Barandilla, Leonie du Rand, Flippie van Dyk, Indrin Naidoo, John Houston, Terry Smith, Thinus Grobbelaar and Pieter van Riet.

Comment – Chairman of KwaZulu Natal

July saw Craig Woolhouse, Elcometer UK, present at our technical evening on, Development of Soluble Salt Contamination Measurement. The Evening was largely effected by major rainfall that covered most of KZN, some areas recording its highest rainfall for many years. However this didn't stop some of us and I would like to thank those that braved the bad weather, it was definitely an interesting topic and an evening enjoyed by all present.

We also hosted our annual Charity Golf Day, August, at the Kloof Country Club and as always was a massive success with all proceeds being donated to the Highway Hospice.

Ryan van Wyk, Chairman

Obituary: Michael Arthur Ashley Brett

The Corrosion Institute regrets to advise that Michael Brett, a founder member of both the South African Corrosion Council and the Corrosion Institute of Southern Africa, passed away recently after a short illness.

Michael was a president of both the SACC and CorrISA, a silver medallist, a gold medallist and an honorary Life Member. After moving from Johannesburg to Durban in 1982 he served as a council member and chairman of the Natal Branch.

The Institute would like to extend its condolences to family and friends.

Michael was one of the stalwarts of the corrosion protection industry in South Africa. After a period in the protective coatings application industry he perceived a need for independent corrosion consulting and quality control services in the industry. In 1970 he launched Michael A Brett and Partners, the first independent Corrosion Consulting Practice in Southern Africa. After leaving MAB&P in the late 1980s he started Corrosion Advisory Technical Services (CATS) which he was still running when he passed away.

Although small in stature, Michael was a giant in presence, ability and ambition. He can best be summed-up by his nick-name at the Wanderers Golf Club where he was affectionately known as Michael 'Walk Tall' Brett.

I first met Michael in 1969 when, as a third year Metallurgy student at Wits University, I attended my first monthly technical evening of the SACC at the Copper Development Pavilion at the Milner Park Show grounds in Johannesburg. That was the start of a 47 year friendship with Michael, with 32 of these years being business relationships, firstly as a partner of MAB&P with Michael, his brother Charlie and later Neil Webb, and secondly as a Member

of Corrosion Advisory Technical Services (CATS) with Michael.

I consider myself privileged to have had Michael as a friend, business associate and mentor for so many years. Michael's contributions to the corrosion protection industry in South Africa will be sorely missed as will Michael as a friend and colleague to many.

Colin Alvey

AfriCORR 2016 – Feedback

6 Plenary Speakers | 4 Keynote speakers | 28 general speakers | 1 Panel Discussion (4 panelists)
88 delegates | 2 Corrosion School Workshops | 10 Exhibitors | 5 Sponsors

Although Monday 25 August dawned rather chilly, there was great interest and enthusiasm surrounding our French cathodic protection expert Prof Phillippe Refait, renowned local cathodic protection stalwart Mr Neil Webb and microbial induced corrosion guru Dr Reza Javaherdashti, as they welcomed 44 eager delegates to the AfriCORR corrosion school workshops.

The corrosion school workshop delegates were treated to two intensive days focused on sharing in-depth information and knowledge covering some very practical approaches to the topics of discussion, namely: "Cathodic Protection: Research and Reality" and "Microbiologically Influenced Corrosion". The passion of the lecturers for their subject matter was palpable and every delegate found value in the material presented and left enthused to "dig deeper" into their chosen discipline.

The success of the corrosion school workshops raised expectations for the AfriCORR16 Congress itself and delegates were definitely not disappointed! Staying true to its mandate to provide a forum for the interchange of ideas and research between academia and industry, the format of the 3-day AfriCORR16 Congress was a "technical congress" with research papers and industry case studies as the primary oral presentations with poster presentations from several students.

The second biennial African Corrosion Congress (AfriCORR16) opened with an outstanding plenary lecture presented by Prof Alison Davenport. She held attendees spellbound as she discussed the fascinating use of high intensity X-rays to further understand corrosion mechanisms. For many delegates this was their first exposure to the possibilities of synchrotron facilities which generated extensive discussion.

Interest and discussion did not stop for the full three days of the Congress as a further five Plenary speakers, four key-note speakers and twenty-eight additional oral presentations stimulated discussion, debate, question and challenge.

AfriCORR16 was honoured to host internationally renowned Plenary speakers who generated thought provoking discussions with their presentations, expressed genuine interest in local research and presentations and engaged in rigorous discussions with researchers and industrialists alike. They willingly shared experience, expertise and insightful comment.

The Plenary sessions stimulated interest, discussion and debate. Mr Deon Slabbert of Sasol shared some of the real impacts of corrosion in day-to-day life on a well-known South African plant and highlighted the practical use of failure analysis in managing these assets. This was further borne out as Dr Reza Javaherdashti explored further corrosion management perspectives and the importance of not disregarding the invisible corrosion inducing microbes. Bacterial infections gained a new meaning!

The flow of the Congress was structured to flow from corrosion mechanisms, via forms of corrosion and failure analysis to forms of mitigation. Our third Plenary speaker, from the Netherlands, Dr Arjan Mol presented an interesting review of self-healing coatings before Prof Phillippe Refait from France took a look at some of the more theoretical aspects of cathodic protection. The final Plenary speaker at AfriCORR16 was Mr Craig Botha, renowned for his wisdom and

Council Meeting

Strategic planning by a recent Corrosion Institute Council Meeting.

insight on numerous local and international projects. He was able to share some of his extensive experience as an entrepreneur as he introduced entrepreneurship to the corrosion mitigation story.

The final session of the Congress was presented as a Panel Discussion on the topic "Corrosion Costs: Who Pays?" This new-comer to the AfriCORR forum proved to be well-received by panelists and delegates alike. Rigorous debate ensued between Academia (represented by Prof Herman Potgieter from Wits University), Industry (represented by Sibthayn Rajab from Sasol), Entrepreneurs (represented by Mr Craig Botha of RelgnIte) and the "Youth" (represented by Ms Yonela Mgwebi and MSc student at Wits University) with able Chairing (or fierce microphone control!) by Prof Lesley Cornish. It was encouraging to see the debate was not contained to the Panelists but extended throughout the Congress delegates with penetrating questions being asked and challenging solutions being sought. Despite the lateness

of the hour on the last day of the Congress, the Panel Discussion held the attention of everyone present and there have been numerous requests to incorporate this format in future AfriCORR events.

AfriCORR16 was not only an intellectually stimulating smorgasbord of information sharing. The venue, Midrand Conference Centre proved a welcoming venue with delicious teas and lunches ensuring everyone was well-sated. The social aspects extended beyond teas and lunches and included networking opportunities on both evenings.

The Wednesday evening was the formal Opening of the Exhibition and judging of

the student poster presentations during the Congress Cocktail function. This format also allowed exhibitors and delegates to network on a more informal basis and this networking continued during the Congress dinner on the Thursday evening.

The formal part of the Congress dinner function saw the presentation of "best poster" and "best student presentation" awards by CorrISA President, Mr Edward Livesey.

Best Poster awards were presented to Ms Fortunate Moyo and Mr Ryno van der Merwe. The well-deserved Best Student Presentations were awarded to Ms Yonela Mgwebi and Ms Elsie Nsiah-Baafi.

Mr Livesey continued in top form throughout the evening, challenging diners to present their best diagnosis and sample history for various corrosion examples strategically located on each of the tables. Penalties abounded and he encouraged everyone to contribute generously to raising funds for the AfriCORR16 charity, The Love Trust (www.lovetrust.co.za). R2500 was raised (in small change) on the evening and we were able to double that from Congress monies to present The Love Trust with R5000 donation. The evening was great fun and one which attendees will long remember.

Of course a congress cannot be organised without funding and AfriCORR16 is no exception. We are indebted to the generous sponsorships received from DST-NRF Centre of Excellence in Strong Materials (Wits University); Solartron/ Ametek; Isinyithi Cathodic Protection; BAMR-Elcometer and Kansai Plascon. Thank you – once again.

In addition to comments regarding housekeeping and organisation (which can always be improved) AfriCORR16 received some encouraging and positive comments including:

- *Awesome, there is a great improvement on 2014 congress*
- *Thank you to organising committee CorrISA and AfriCORR for wonderful workshop & Congress – looking forward to AfriCORR18*
- *Good congress – can't wait to experience new groundbreaking and exciting AfriCORR18*
- *It was such an experience I will always treasure. Informative eye-opener and challenged my academic decision for my future. I wouldn't mind attending every conference – AfriCORR*
- *Continue to grow the AfriCORR brand. SA needs to lead African corrosion and incorporate industry, academics and commercial aspects*
- *Perhaps a funding opportunity can be made available for students who would like to attend without the necessary / financial stability to register*

Planning for AfriCORR18 is already in full swing!

For more information or if you would like to contribute to the future success of AfriCORR, please visit our website: www.africorr.org.za or contact us: info@africorr.org.za

67 Minutes for Mandela Day 2016

The CorrISA team gave 67 Minutes of their time on Madiba Day to plant vegetables at Cresset House in Glen Austin, Midrand and sponsored them with plants and seeds. Cresset House is a home that provides care based on the extended family concept in such a way that psychological, health, safety, material and spiritual needs are provided for in a loving and caring atmosphere.






Corrosion Institute KwaZulu Natal Golf Day 19th August 2016

The Corrosion Institute held its annual Golf Day at the Kloof Country Club, KwaZulu Natal. Once again the day was superbly supported with 20 four-balls taking the field. Golfers, non-golfers even a few hackers all took part in this fundraising event. The weather gods also played along this year and blessed us with a wonderful day.

All the funds raised for the day are donated to the Highway Hospice, who rely almost completely on public donations rather than government funding.

A huge thank you must go out to all the participants and sponsors alike, without them this day would not be possible.

Winners of the day – Team Stoncor (from left to right) Gareth Purchase, Graeme Smith, Jacques Kotze, Chaunce Boonzaier.

Team Denso enjoying some of the refreshments on offer.

Buster, our MC for the evening distributing some fines before prize giving.

TECHNICAL EVENT: Johannesburg

TECHNICAL EVENT: KwaZulu Natal

TECHNICAL EVENT: Cape Town





NACE CATHODIC PROTECTION 2 – TECHNICIAN (CP2)

NACE INTERNATIONAL

Description

Course topics include intermediate level discussions of corrosion theory and CP concepts, types of CP systems, CP interference, introduction to CP design and advanced field measurement techniques. This course provides both theoretical knowledge and practical techniques for testing and evaluating data for both galvanic and impressed-current CP systems. The course is designed for persons who either have an engineering/scientific background and some working knowledge of CP, or have several years of CP field experience with a sound technical background. High school science and mathematics, comprehensive knowledge of electricity, electrical laws and circuits, meter operation and CP fundamentals are necessary for the understanding of the material in this course. Entry Level CP 1

Aimed at

- Project engineers
- Field technicians corrosion industry suppliers
- Quality assurance managers
- Contractors
- Technical sales representatives
- Maintenance personnel

Recommended entry requirements

- CP1
- English Literacy
- Matric or higher qualification
- 6 month CP experience
- Students who do not have any CP experience may be successful in this course if they are able to grasp scientific concepts and perform basic mathematical calculations (basic algebra fractions and conversions)

Cost

- Please see the registration form

Supplied

- Course manual and workbook
- Lunch, light snacks and refreshments

Date : 7th – 11th November 2016

Venue: the CORe - Midrand

For More information contact:

LINDA HINRICHSEN

COURSE ADMINISTRATOR

Tel: +27 010 224 0761
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Fax: (086) 726 0318
email: courses@corrisa.org.za

CORROSION INSTITUTE SOUTHERN AFRICA

NACE CIP TRAINING COURSE: Johannesburg

NACE CIP TRAINING COURSE: Cape Town (Practical)

CORROSION ENGINEERING COURSE: Johannesburg

NACE COATING INSPECTION PROGRAMME Level 1 (CIP1)

Description

This course provides both the technical and practical fundamentals of coatings inspection work for structural steel projects. This course provides students with knowledge of coating materials and techniques for surface preparation and application that prepares the student to perform basic coating inspections using non-destructive techniques and inspection instrumentation. Although specifically designed for coatings inspection trainees, this course will benefit anyone interested in gaining a better understanding of coatings application and inspection.

Aimed at
- Inspectors
- Corrosion industry suppliers
- Quality assurance managers
- Contractors
- Plant managers and operators

Recommended entry requirements
- English Literacy
- Matric or higher qualification
- **1yr industry experience**
- CIP1 for CIP2
- CIP2 for CIP3

Supplied
- Course manual and workbook
- Lunch, light snacks and refreshments

Duration
- CIP1 & 2 - 5 days plus 1 for Exam
- CIP 3 – ½ day peer review interview and test

Date : 14th – 19th November 2016
Venue: The CORē, Midrand

For More information contact:
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NACE COATING INSPECTION PROGRAMME Level 2(CIP2)

Description

This course focuses on specialised methods of surface preparation and application, and coating types for both steel and non-steel substrates. Advanced inspection techniques and shop coating process are presented. Students will learn about destructive test instruments and more sophisticated non-destructive test methods. Inspection criteria, failure modes, laboratory testing and comprehensive instrument review are included. The CIP Level 2 course may be taken by students who have achieved CIP Level 1 certification. .

Aimed at
- Inspectors
- Corrosion industry suppliers
- Quality assurance managers
- Contractors
- Plant managers and operators

Recommended entry requirements
- English Literacy
- Matric or higher qualification
- 1yr industry experience
- CIP1 for CIP2
- CIP2 for CIP3

Supplied
- Course manual and workbook
- Lunch, light snacks and refreshments

Duration
- CIP1 & 2 - 5 days plus 1 for Exam
- CIP 3 – ½ day peer review interview and test

Date : 17th – 22nd October 2016
Venue: The CORē, Midrand

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The RUST Spot...

in conversation with Dr Colin Alvey

The RUST Spot caught up with Colin Alvey recently at his home in Ferndale, Johannesburg.

Born in Brighton, England in 1946. Moved and settled in South Africa in 1953. He matriculated from the Vaal High School in Vanderbijlpark in 1963.

Colin's tertiary education started at the University of the Witwatersrand (Wits) as a Metallurgy student. In Colin's final year he selected to investigate "The effects of cathodic overprotection on proprietary coating systems and on the underlying metal". The machined steel samples were painted by Michael Brett at Hume Monoweld Corrosion Protection (HMCP), who were then corrosion protection application specialists. This was the start of Colin's association with Michael Brett and his interests in protective coatings. All the coated samples were subjected to cathodic disbondment tests at the Wits laboratory where Colin studied under Prof Paul Robinson. Always having a loaded camera to record the state of the samples proved to be a benefit as every time Paul went to a site for a corrosion problem Colin accompanied him to take photos. The journey to the site was significantly enhanced by the fact that Paul drove a red Porsche, which to keep students away from his car had a "Radiation" sticker on the back bumper. These site visits served as a kind of 'consulting apprenticeship' resulting in Colin eventually entering the corrosion consulting field. The Porsche had nothing to do with it as Colin is actually a Jaguar and Mini fan.

Colin graduated in 1970 and as his studies had been sponsored by Anglo found himself back at their offices expecting to be posted to some out of the way mine. To his surprise when they heard he had studied metallurgy majoring in corrosion they advised that they had no post for him as they believed corrosion did not happen in the mining industry! He concluded a payment option which released him from his bursary obligations.

Colin started working at HMCP and during this time thought he would like to go to London for a 'jolly' as many students did in those days. He was also considering combining his overseas visit with post-graduate studies. He mentioned this to Paul Robinson who put him in touch with his friend Prof Ken Ross (Professor of Chemistry in charge of Corrosion Studies) at the University of Manchester Institute of Science and Technology (UMIST). 3 months later Colin found himself starting his MSc research topic "Mechanical Properties of Anodic Oxide Films" under the supervision of Prof Graeme Wood. To fund his studies, Colin was initially employed in a metallography teaching laboratory that had been set up for non-metallurgical graduates who were attending the UMIST post graduate MSc course in Corrosion Science. This course was attended by a number of graduates from South Africa, one of whom was Bob Andrew who later became a well-known figure in the corrosion protection industry in South Africa.

During his time at UMIST Colin kept in touch with Michael Brett who had invited him to join his new consulting practice on the completion of his studies. Colin finished his doctorate in 1974 and returned to South Africa, joining Michael Brett and Partners (MAB&P) as a partner in 1975. MAB&P then comprised Michael and Charlie Brett and Colin Alvey and were the first independent corrosion consultants in South Africa.

In 1981 Anglo American undertook the Richards Bay Coal Terminal – Phase III project but wanted to source corrosion protection and welding specification and quality control activities from a single source. This lead to the formation of the TCB Consortium which comprised an association between TUV Rhineland (South Africa), CHEL (Corner House Engineering Laboratories) and Michael A Brett & Partners. The Consortium was managed by the respective MD's of the member companies viz. Hennie Prinsloo, Chris Reay and Michael Brett .

In 1983 TUV were looking to expand in South Africa and started by purchasing MAB&P. Michael had relocated to Durban for health reasons and Colin was promoted to MD of MAB&P, reporting to TUV. In 1986 he was appointed as MD of TUV. Murray and Roberts were then unbundling and TUV bought CHEL. The TCB Consortium had become the TUV Rhineland (SA) Group of which Colin was promoted to MD.

By 1998 Colin had had his fill of management and yearned to return to the protective coatings industry. He joined Plascon as Group Technical Director – Heavy Duty Coatings to manage their involvement in the supply of heavy duty coatings to the Mossgas Project, liaising with the 4 Plascon manufacturing centres in Alberton, Durban, Cape Town and Port Elizabeth in order to manufacture the vast volumes of coatings required for both the off-shore platform as well as the on-shore refinery. When this challenge ended Colin again looked to the consulting industry, fortunately at the same time as Michael Brett started Corrosion Advisory Technical Services. Colin was reunited with his former colleagues Michael and Charlie Brett at CATS. CATS was split into two close corporations with Michael running CATS (Durban) and Colin running CATS (Randburg). In 2013 Colin considered retiring and, having closed CATS (Randburg), joined Dr Chris Ringas at Pipeline Performance Technologies on a

part time basis. At the end of 2014 he finally hung up his paint film thickness gauge and retired although he still assists his old clients with the occasional technical queries on a 'pro-bono' basis, giving back to the industry that had supported him for 40 years.

Colin has had a long association with the Corrosion Institute of Southern Africa

- 1975 Member of the Corrosion Institute of Southern Africa
- 1981 Fellow of the Corrosion Institute of Southern Africa
- 1983 Silver Medal
- 1982 – 1987 Member of Council
- 1989 – 2001 Member of Council
- 1993 – 1995 President
- 2000 Gold Medal
- 2011 Honorary Life Member

In 1993, together with Chris Smallbone of the South African Institute of Welding, Colin founded the South Africa Qualification and Certification Committee (Corrosion), setting up and running training courses for coating inspectors, coating applicators and coating supervisors. The SAQCC activities continue today through the Corrosion Institute of Southern Africa.

Colin has always held strong views on the position and necessity for the corrosion engineer within the engineering profession and the competency and training of corrosion protection practitioners. Some of his quotations taken from various publications over the past few years:

- "While I don't need to know anything about civil engineering to give a uranium plant an acid proof floor, the civil engineer would be required to know something about corrosion protection in order to do so." *Engineering Week 18 April 1980.*
- "Corrosion engineering is a hybrid of metallurgy, chemical engineering and pure chemistry and it is not possible to study for a degree in corrosion engineering."
- A corrosion consultant while being technically competent by way of qualifications or experience he should be completely independent and commercially unbiased and must not be involved in any contracting activities or be retained by any supplier of products into his particular area of activities, otherwise his technical judgement is swayed towards the products or services of the company with which he is commercially involved."
- "The client is partly to blame for the hire of unqualified or inexperienced corrosion consultants who are not commercially independent and do not offer a technically correct solution to a particular corrosion problem because in many cases consulting services are still selected on the cheapest price rather than a proven track record or competency basis." *Engineering News 26 April 1996.*

Colin's major gripes are:

- As President of CorrISA in 1994 Colin took on the task to conduct a survey of 24 Universities and 15 Technicons and found that very few offered any form of corrosion technology training for their engineering and science students. Following this study he implemented several initiatives through the Institute to offer corrosion training to graduate engineers and corrosion protection practitioners. However, Colin recognised at that stage that until Corrosion Engineering becomes a recognised engineering discipline alongside mechanical, civil, electrical, mining etc. the dissemination of knowledge on corrosion prevention technology is a daunting task!
- Any qualification or education in SA today can be bought without any prerequisite experience.
- Modern day graduates who are the specifiers of tomorrow are not prepared to get involved in the activities of the Corrosion Institute where corrosion science is likely to be discussed or try to understand the subject of corrosion protection. They find it easier to pass the responsibility of corrosion protection specifications onto the paint manufacturing companies and paint applicators with the accompanying risks.

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

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Simple Active Tactics is an Atlantis based manufacturer of recycled steel and glass grit abrasives.

The company specialises in all types of granular abrasives which include ecoblast® (synthetic garnet), steel and stainless steel grit and shot, aluminium oxide, garnet, silicon carbide, glass grit and beads.

High demand for its rapidly expanding market in the Western Cape prompted the company to open a new 960m^2 warehouse in Atlantis to accommodate the growing demand for its products.

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Simple Active Tactics, based at Atlantis Cape Town, now produces pure white glass grit abrasives trade named "Glass Whizdom" to supplement its recycled steel abrasive product range. The company has specialised in converting industrial waste streams of materials, previously dumped on land fill sites into low cost abrasives which offer outstanding value.

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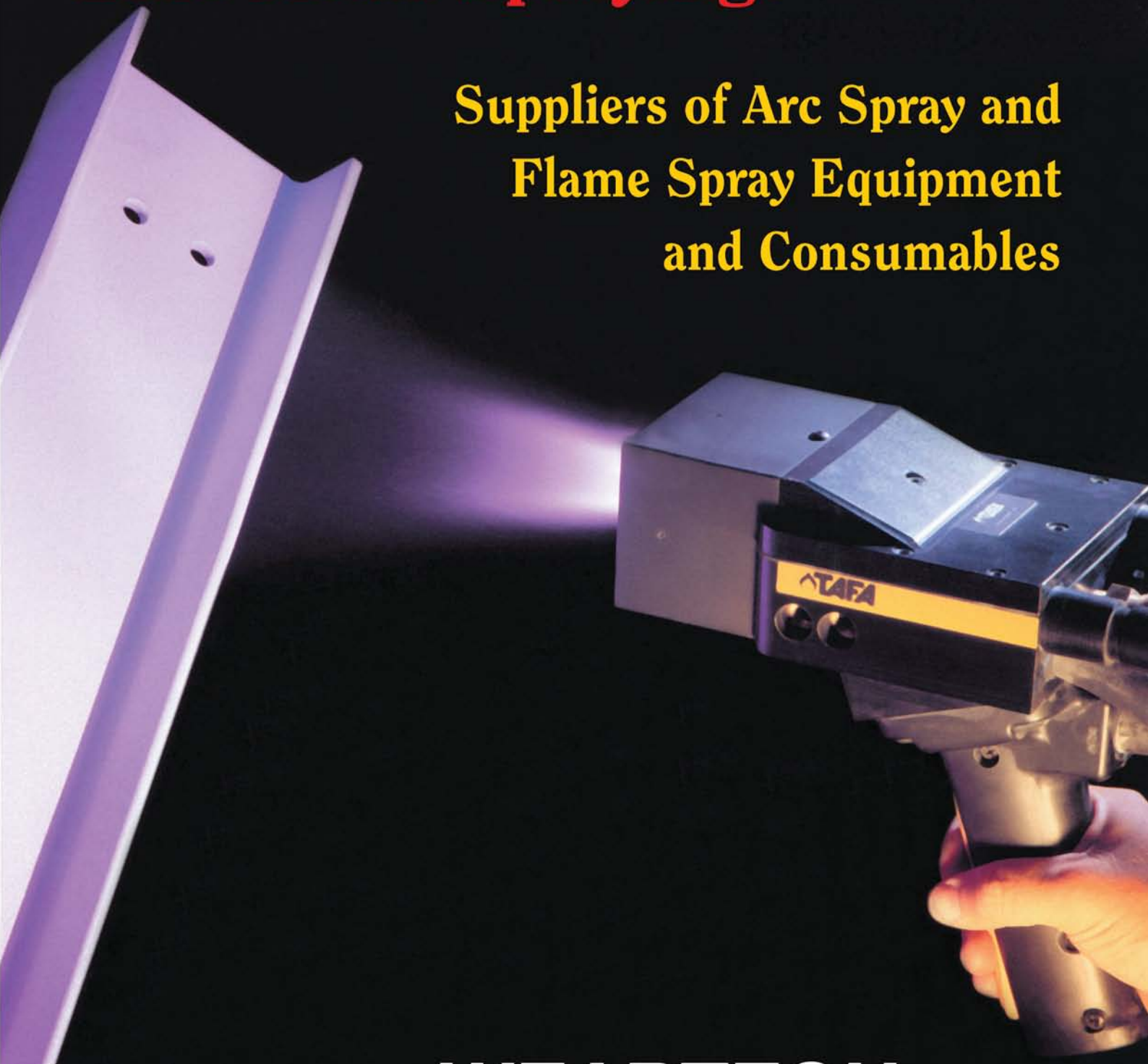

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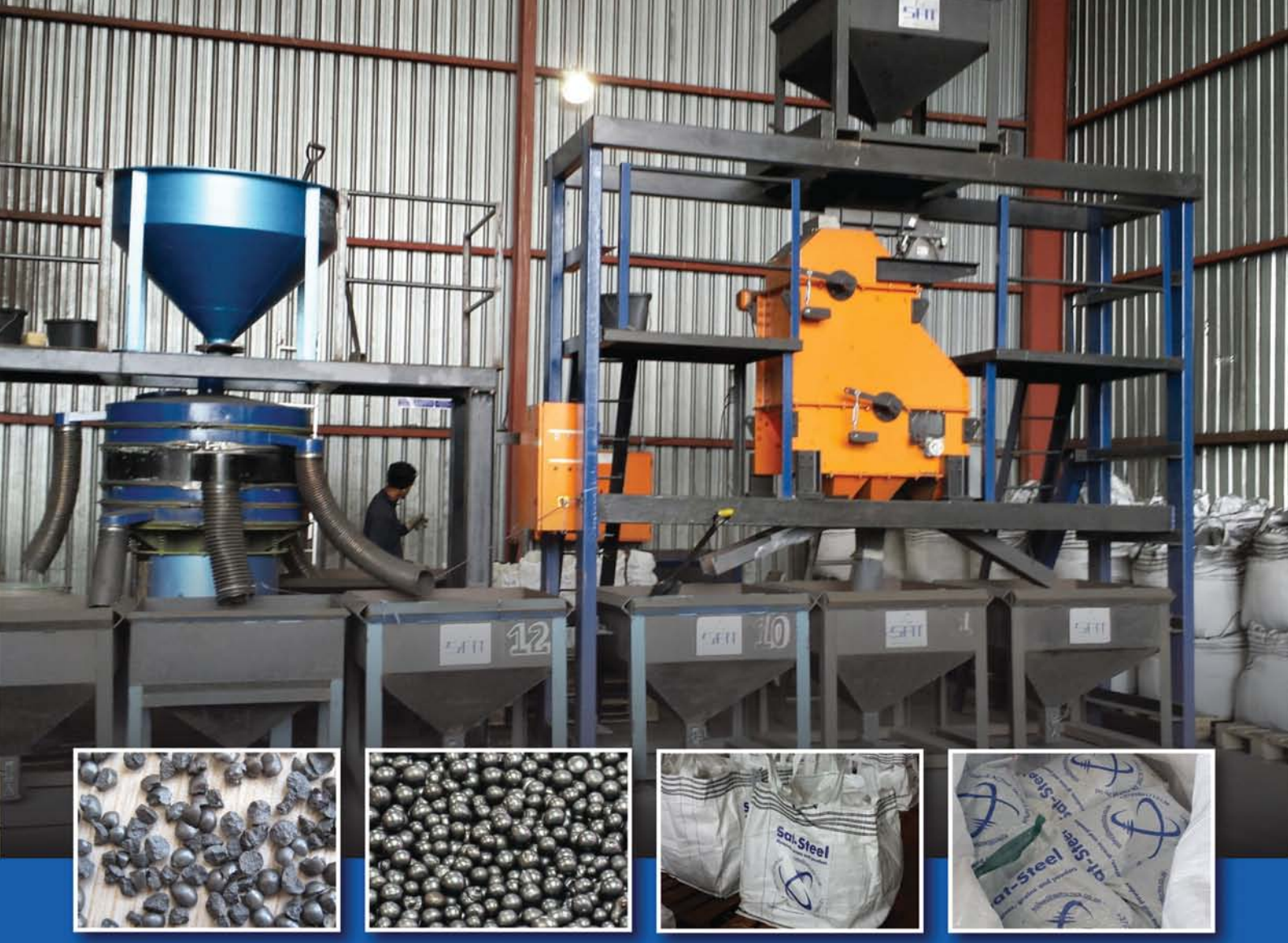

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