HOT DIP
GALVANIZING TODAY
2008 Volume 5 Issue 4
HOT DIP GALVANIZERS ASSOCIATION Southern Africa
37

Featuring:

Tubes, pipes and scaffolding

The difference between general and continuous hot dip galvanizing

Duplex coatings: Why are they necessary? Duplex coated steel pipe

Coating report: “Wamosha”; Misconceptions; Case Study

Guest writer; Bob’s Banter and “On the couch”

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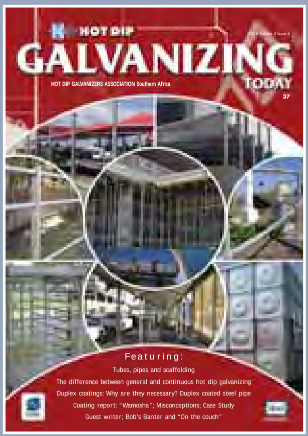

The Association is a technical information centre established for the benefit of specifiers, consultants, end users and its members

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37

CONTENTS

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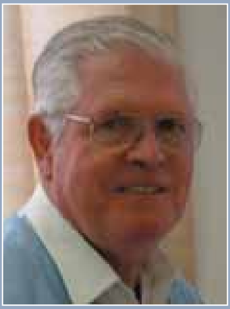
Front Cover: *A kaleidoscope of photographs showing tubular and water storage projects and products.*

Hot Dip Galvanizing – Adding value to Steel

Executive Director's Comment



One of our primary objectives, as an Association, is to provide a technical data base for members and engineers involved in appropriate applications of hot dip galvanizing and duplex coating systems used in the fight against corrosion of carbon steel structures. This educational objective is achieved by technical presentations at conferences, mini seminars, and short 40 to 45 minute technical presentations to consulting engineers, end users, fabricators and member galvanizers. In addition, the Association offers educational training, one of which is a two day Certificated Galvanizers Inspector's Training Course, which is an intensive programme that culminates in a three part written examination. It is also noteworthy that the course has approval to award 2 CPD points to professionals within the engineering fraternity.

Over the period of the past 12 months, we have been encouraged by the positive reaction received from players within the corrosion protection industry and in particular from third party inspectors who have participated in our Association training programme.

The increased numbers of third party inspectors who have attended our courses has been due, in no small way to a member galvanizer of the Association, adopting a policy of sponsoring inspectors from consultants and fabricators who have responsibility for inspection and release of galvanized materials from the said galvanizer's yard. Appropriate training of inspectors representing fabricators, consultants and end users, is having positive benefits for both the third party representative as well as the hot dip galvanizer concerned. These positive results have come about by the fact that third party inspectors are now talking the same language as the galvanizer. Inspectors are able to relate to numerous aspects of "what comprises hot dip galvanizing and duplex systems as a material of construction", which clearly is not just another form of corrosion protection coating. Quality control inspections and material releases from the galvanizer are been facilitated as a result of the project parties "singing from the same hymn book". Please excuse the analogy, but appropriate knowledge, of this kind, is proving beneficial to all the project team players. Details of our Certificated Inspector's Course are published in the magazine and our web site, which you are encouraged to visit.

Bob Wilmot

Note from the Editor

"Corrosion engineering is the specialist discipline of applying scientific knowledge, natural laws and physical resources in order to design and select suitable materials of construction for carbon steel structures and components to combat corrosion, commonly known as RUST.

While some efforts to reduce corrosion merely redirect the corrosive damage into less visible and predicable forms, controlled corrosion treatments using hot dip galvanizing and duplex coatings, will increase a material's corrosion resistance, but will also allow service life predictions to be established.

Before providing a proper corrosion engineering solution, an evaluation of the corrosivity of the environment at hand or the current protective coating system against its past performance, is essential.

At the Association we pride ourselves in providing cost effective technical and factual advice in the use of hot dip galvanizing and duplex coating systems. We are always happy to be involved in the evaluation and inspection of previously exposed and weathered hot dip galvanized or duplex coated components.

Should a reader require this evaluation and inspection service, kindly contact Bob or myself.

Our feature for this issue includes tube, pipe and scaffolding and also water storage facilities.

Following a number of instances where contractors are supplying continuously hot dip galvanized (PG) components in favour of generally hot dip galvanized because of varying reasons, we include for your reading the differences between the two coatings. Also included is the introduction of an identity sticker, which will be applied by galvanizers from early 2009, where necessary to identify general hot dip galvanizing.

Under Duplex Coatings, we publish an interesting article on a Duplex Coated Lula Pipe System for enhanced corrosion protection both inside and outside of the pipes. Articles featuring the differences between QA and QC in terms of coatings and from one of our members, why duplex coatings are necessary?

Education and Training, expands on our certificated coating inspectors course, an essential requirement in any coating inspectors portfolio. From 2009, we will be conducting this course in Cape Town but can run the course anywhere in South Africa, provided we have six or more participants, limited to a maximum of twelve.

The Coating Report expands on our experiences of "suspect" hot dip galvanized guard rails fixed at the sides of the road about 500km north of Windhoek, Namibia.

The Case Study includes an in depth look at how machine parts used on the Raise Tech W50 Mining Drilling Machine were hot dip galvanized.

Other regular articles include Misconceptions, where Miss challenges the sceptics with "Is the world running out of zinc?"

Walter in Walter's Corner discusses some of his early hot dip galvanizing experiences.

Bob Andrew in his own column, Bob's Banter chats about "Michelangelo Arguments".

Our Guest Writer, for this edition is Darelle Janse van Rensburg, a reputable corrosion consultant, who chats about "Performance Testing of Protective Systems".

"On the Couch" includes an interview with Jeremie of Jeremie Malan Architects in Pretoria.

Taking coating thickness readings with a calibrated instrument, is important for all coatings. We include the second article in the series that covers, "What influences the reading?"

Should a reader wish to express an opinion or provide us with an article, kindly contact me.

At the closing of the year, may we take this opportunity to wish all our readers good health and happiness for the imminent festive season.

Enjoy the *"magazinc"*.

Terry Smith

2008 HOT DIP GALVANIZING AWARDS EVENING

Photos taken at the 2008 Annual Hot Dip Galvanizing Awards Evening showing a number of our esteemed guests.




















HOT DIP GALVANIZING AWARDS EVENT 2009

Dear reader

Following the recent successful 2008 Awards Event it was decided that in order to provide sufficient time for those that wish to nominate an entry for 2009, the following was seen as necessary:

1. Call for Nominations for 2009 is now open and will close end of March 2009.
2. These nominations will then be considered and a submission will be prepared, in conjunction with an Association staff member and the project team / hot dip galvanizer
3. Nominations for 2010 will close at the end of December 2009. Thereafter subsequent nominations will close in December of the previous year.

A one-page nomination document can be downloaded from our website, for the purposes of entering the Awards Event in 2009. Kindly include some photos in your nomination. This will benefit the submitter by allowing time to visit the projects and research it correctly.

Whilst March feels like an eternity away – we all know how fast time flies – please start thinking about possible nominations.

Should you have any queries please do not hesitate to contact Saskia Salvatori at our offices.

Giuricich Coastal Projects goes galvanized

With the procurement of a 50 000m^2 building contract for Mercedes-Benz in Pinetown some 26 years ago and a set policy to purchase rather than hire plant and equipment, Giuricich Coastal Projects (GCP) had to consider the effect of the corrosive environment in KwaZulu-Natal on their investment in access scaffolding and formwork support systems. At the time, the perceived large 'on cost' to hot dip galvanize the equipment, resulted in an incorrect decision to purchase 'non-galvanized'.

Within four years of purchase GCP had to embark upon an expensive refurbishment programme in an attempt to protect their investment from being destroyed by rust. This refurbishment entailed de-scaling the external and internal surfaces (where possible) using mechanically driven wire brushes, and thereafter, dipping the components firstly into a rust

Hot dip galvanized scaffolding stacked on site for imminent erection.

The hot dip galvanized scaffolding will be monitored for its service life durability.

neutralising solution, then into a paint primer and finally into an enamel finishing coat.

At year 9 after purchase, the refurbishment process was repeated at a cost of 40% of the original purchase price of the scaffolding.

Upon realisation of the total refurbishment expense, GCP decided to stop all further rust control measures and allow the equipment to deteriorate over time, to scrap value. This decision in itself was problematic in that working safely had been prioritised by GCP and it was impossible to accurately determine to what extent the rust had reduced the load-bearing capability of the various components. In reality, it came down to a visual inspection and whether or not the scaffold tubing deformed under the light impact of a hammer, clearly not a very sophisticated or reliable test. From year 20 to 25, the equipment was progressively converted into scrap value ending the life cycle of the investment.

When GCP identified the need to invest a further R4.0 million in access scaffolding and having learnt from bitter experience, the decision was made to go with hot dipped galvanizing. The logic being that the sacrificial zinc coating would protect the base metal for hopefully 25 years or more and only thereafter would maintenance programmes be implemented to slow down the deterioration of the equipment due to rust. Hopefully the life cycle of the equipment will at least double. A major benefit is the peace of mind knowing that the structural capability of the support equipment will not be impaired during the life span of the sacrificial zinc coating. The safety of our employees and sub-contractors who operate off our scaffolding is extremely important to us. GCP is very safety conscious and employs a full-time health and safety manager, a health and safety training officer as well as safety compliance officers.

In 2008 GCP won the MBA Regional Safety Competition in for buildings

Other than being cleaned of cement deposits, which do not affect the life of the coating, the hot dip galvanized scaffolding can be easily monitored for its performance over its service life.

valued between R50 and R100 million and was runner-up in the National Competition. The Hot Dip Galvanizers Association of SA has displayed keen interest with regard to monitoring the performance of the zinc coating over time and has agreed, on an annual basis, to inspect pre-identified components, record the deterioration and report on the performance in the protective coating.

Rodney van der Walt – Managing Director.

OBITUARY

Bruce Shaw

16 February 1948 –
11 September 2008

We are deeply saddened to advise the passing onto a higher order of Bruce Shaw, the Quality Assurance Manager of T & E, an Affiliate Member of this Association.

Bruce had kidney failure some 5 years ago. His wife, Anne, donated a compatible kidney which improved his quality of life for the past 4 years, but unfortunately he succumbed to secondary illness due to immune system depression.

Bruce worked diligently and without favour for 16½ years at T&E. During this time he built up a Q.A. department which was the envy of clients and competitors alike. With his knowledge and expertise he earned the ultimate accolade of respect… "If Bruce did it, it's right".

We will miss him.

Structural tube – a short history

Structural Tube has been manufactured and used in structural applications for many years. Probably the biggest break through in the use of tube in South Africa took place in June 1997 when graded Structural Tube, Structatube 300, was made readily available. The need to launch Structatube 300 was identified in the early 1990. This initiative was coordinated by the South African Institute of Steel Construction and the members of the Association of Steel Tube and Pipe Manufacturers of South Africa that produced Structural Tube.

Structatube 300, could be defined as structural hollow sections that is made from input material that conforms to SANS 1431 300WA grade of steel. In accordance with 300WA the steel has a minimum yield stress of 300MPa. Previously the tube was manufactured from various commercial quality grades which did not have guaranteed mechanical properties.

In many cases engineers were therefore reluctant to specify Structural Tube. When the graded steel tube was launched it not only gave the engineers confidence to design in tube but more importantly made tube more competitive. The higher strength resulted in thinner sections therefore more completive sizes being specified and used. Since the launch of graded steel the usage has more than doubled over the last ten years.

Going forward the tube industry is aiming to making grade S355, tube with a minimum of 355MPa yield, the standard for structural application. This will put Structural Tube back in line with other structural section and therefore more competitive. Trials are currently underway. The industry is hoping to launch this grade of steel for tube within the next 6 months. With the price of steel having increased significantly over the last 4 to 5 years the typical mass savings using tube will become a bigger factor in deciding the profiles to be used. The mass saving, specifically in compression or torsion application using tube can be as high as 40 to 50%.

The Association wishes to thank Franco Mordini – Marketing Director, Robor Steel Services, for this contribution.

ABECO TANKS – THE NAME THAT HOLDS WATER

Several thousand tanks successfully installed in Africa and South America

Established in 1983, Abeco Tanks is a leading innovator in the development of water storage solutions. Abeco Tanks is committed to developing cost effective solutions for water storage needs in communities with limited resources.

Products:

- Galvanized pressed steel tanks;
- Support towers for elevated tanks;
- Circular bolted tanks.

Features:

- Rugged, simple modular design.
- Guarantees safe, hygienic and durable water supplies.
- Sectional steel water tanks are easy and quick to install.
- Transportable to remote locations.
- Minimal site preparation for circular bolted tanks.

Applications:

- Mainly potable water, but also
- Hot water; effluent; fuels; corrosive liquids.

Abeco
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25 Years of bulk water storage

This year, a Johannesburg-based designer and manufacturer of pressed steel water storage tanks celebrates 25 years of successfully providing solutions for the hygienic storage of water and other liquid storage applications.

Abeco Tanks was established in 1983 and soon came to realise that the greatest need for sanitary water supply lay in communities with limited resources.

Says CEO Mannie Ramos, "We adopted as our guiding principle the development of the most cost effective solutions to water storage needs without compromise to safety, hygiene, quality or durability. Product evaluation and development is ongoing in our organisation".

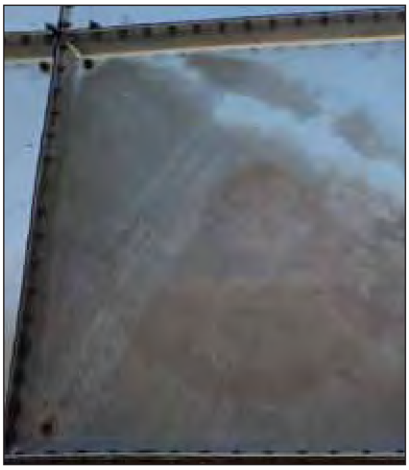
Due to their modular, rugged design, Abeco tanks offer a great number of advantages. They can be transported easily, even to remote sites and installed using basic equipment and manual labour.

Abeco Tanks supply tanks to local authorities, water utilities and township developments to be used as bulk water supply reservoirs. In the agricultural sector, they are used as livestock water supply tanks and irrigation tanks.

Apart from coldwater applications, the tanks can also be used for the storage of hot water, effluent, fuels and corrosive liquids. Examples of such uses are air conditioning tanks, feed water tanks and effluent tanks in public buildings, processing and manufacturing, mining and minerals and power generation.

For corrosion protection, all steel components including bolts, nuts and washers are hot dip galvanized.

Abeco Tanks also export and install their products in other parts of the world. "Not only have we supplied thousands of tanks throughout the Southern Africa region", explains Ramos, "but our tanks can be found in other regions including South and Central America".



The appearance of the above hot dip galvanized panel used for water storage tanks, resulted in an enquiry as to what it was, the following was sent by the Association in reply:

The appearance in the photos indicates the presence of extensive iron/zinc alloy phase growth, caused by steels with high reactive levels of silicon and phosphorus. I would like to suggest that you refer your customer to our web site, www.hdgasa.org.za - go to Technical Publications / Practical Guidelines for Inspection and Repair of Hot Dip Galvanized Coatings / Page 10 / SC No 13 - Dull Grey or Mottled Coatings and also our Information Sheet No 4.

Benefits of the BOTANK Steel Water Storage Reservoir

Due to South Africa being a semi-arid county,*1 and with the increasing demands being placed on our already dwindling water resources, it becomes a case of utmost importance for all to conserve our fragile water resources. Our economic growth has been reduced over past years due to the impact droughts*2 have had on our climate. It therefore, becomes prudent to consider what the appropriate response should be to overcome these obstacles.

Established in 1997 Botank Construction (Pty) Ltd. was founded by W. A. Botha in an effort to provide quality, affordable water solutions to such dilemmas. The Botank Steel Water Storage Reservoir was designed by J. W. Ellis, a consulting civil engineer from the firm Ellis Construction. Using radiused, hot dip galvanized steel panels with a thickness of 3mm upwards, this high quality steel reservoir is lined on floor and wall surface with a geofabric lining as protection and provides a waterproof liner using a robust polyethylene sheeting in 1.5mm to 2mm thickness which is welded into position on site.

Provided the ground conditions are acceptable, the BOTANK can be assembled on an earth base and does not require a concrete foundation. Thus, the BOTANK provides a more cost effective solution for water storage compared to the more conventional concrete reservoirs. This also leads to a faster commissioning date.

While these tanks are entirely erected on site and secured to the surface, they can be demounted and rebuilt at a different location should the client so wish. This makes the BOTANK highly feasible for areas where mining is done. BOTANK Construction has been commissioned recently to provide water storage solutions to mines in African countries like Namibia, Malawi and

continued on page 12...

Sectional steel tanks

Engineered to international design standards, View Engineering designs, manufactures and installs circular bolted steel tanks for use in the storage of water at ground level.

MD of the company, Larry Cohen says, "Our tanks can be erected with minimal site preparation – no foundations are needed as the floor of the tank is formed by a waterproof geo-membrane".

The tanks are constructed from shell plates manufactured from hot dip galvanized mild steel plates. Panel seams are sealed by rubber gaskets and the roof is galvanized cold rolled sheeting. No support posts inside the tank are required.

"The capacity of our tanks range from 1 136 litres to 7 700 litres", added Cohen, "although we can construct tanks of a greater capacity on special request".

Zimbabwe. But BOTANK does not overlook the smaller farmers in local regions that rely so heavily on agriculture for their livelihood.

Ranging in sizes from 60Kl to 5 000Kl, the BOTANK is supplied as a complete structure, with or without roof according to client specification. Where potable water is required, the structure will be roofed to prevent contamination from debris and to protect water quality, providing the perfect answer for new communities. The BOTANK also safely and effectively stores effluent and leachate and prevents contamination to ground, running water bodies and further surroundings.

Finally, the BOTANK Reservoir provides a practical solution for water storage all the while our global population increases constantly and diminishes our most important natural resources to a critical level. With reasonable costs, BOTANK surely rises above its competitors at meeting their client's needs at providing a product of excellent durability and succeeds in their goal at decreasing our constant burden on nature as a sole source of readily available water.

***1** *Denoting land that lies on the edges of a desert but has a slightly higher rainfall (above 300mm) so that some farming is still possible.*

***2** *During the last dry cycle between 1982 and 1995, annual economic growth has e.g. been reduced by between 0.5 and 1.2 % in the four years of 1982, 1983, 1992 and 1995 (Finance Week, 2002). DROUGHT MANAGEMENT IN SOUTH AFRICA* by G.R. Backeberg[1] and M.F. Viljoen[2]*

1) Water Research Commission, Pretoria, South Africa

2) University of the Free State, Bloemfontein, South Africa

AWARDS EVENT ERRATUM

In the previous magazine that covered the Annual Awards Event, we incorrectly had the capacities of the Botank entry as 150 to 400kl. This should have been **4 000kl**. We apologise to Botank for this error.

Technical differences between general or batch type and continuous sheet hot dip galvanizing

	GENERAL OR BATCH TYPE HOT DIP GALVANIZING	CONTINUOUS SHEET HOT DIP GALVANIZING
	SPECIFICATIONS	
Specifications – local	SANS 121 *#1*	SANS 3575 *#2* SANS 4998 *#3*
Specifications – International	ISO 1461	ISO 3575 ISO 4998
Coating grades	None *#4*	Several, must be specified *#5/#6*

	General or batch type			Continuous sheet			
Coating thickness #6	Steel thickness (mm)	Local coating thickness (µm)	Mean coating thickness (µm)	Coating designation *#7*	Average mass of coating	Individual mass of coating	Min coating thickness on one face (µm)
	t>= 6	70	85	Z200	200	170	9.7
	3<= t<6	55	70	Z275	275	235	13.4
	1.5<= t<3	45	55	Z450	450	385	22
	t<1.5	35	45	Z600	600	510	29

	GENERAL OR BATCH TYPE HOT DIP GALVANIZING	CONTINUOUS SHEET HOT DIP GALVANIZING
Steel thickness	Any steel thickness but preferentially greater than 2.0 thick particularly if not shaped or work-hardened.	From 0.28 to 2.9mm thick. *Note: The final supplied steel thickness including the applied zinc coating will be marginally thicker.*
Smoothness and acceptance of the coating	Relatively smooth, depending on steel type, complexity of component and dipping exit angle. Free from roughness and sharp points, particularly at "pre-defined" significant surfaces.	Gas Knives (usually high pressure air) wipe off excess molten metal as the continuous sheet exits the zinc bath, leaving behind a closely controlled thickness of coating.
Ordering, identification and receipt at site	Steel that has been hot dip galvanized by the general process is relatively easy to identify that it is in fact hot dip galvanized. Silver paint that may have been incorrectly used for repair can easily be scrapped off.	The coating grade that has been specified may be difficult to assess in terms of coating grade (and therefore coating thickness) on receipt at site in terms of specification conformity. While taking random coating thickness readings using a calibrated coating thickness instrument are not acceptable in terms of the specification, they will however, provide a reasonable idea of what the coating thickness is and therefore the coating grade that has been delivered. A more accurate and acceptable method in terms of the specification is described in *#8*.
	PROCESS	
Process	Items that are completely fabricated are dipped in a bath of molten zinc at about 450°C and removed at a relatively steep angle and slow speed.	Continuous sheeting is rapidly (100 to 140m/min) passed through a bath of molten zinc at about 450°C and as it exits the bath the sheeting travels through gas air knives that wipe off the excess coating, resulting in the coating thickness designation that was specified.
Composition of the coating	The coating comprises a series of iron/zinc (Fe/Zn) alloy layers, normally over coated by a relatively pure zinc layer.	The coating comprises mostly pure zinc with very little iron/zinc alloy layer (about 1 - 2µm), required for ductility.
Influences on coating thickness	Silicon and Phosphorus and combinations of these two elements in the steel have a major effect on coating thickness and appearance. Steel thickness and surface roughness also have an effect on coating thickness.	Effectiveness of the gas knives.
Zinc melt	98.5% Zn, 1.2%Pb and about 0.007% max. Al.	99.95% Zn, 0.008%Pb and about 0.02% max Al.
Smoothness	Relatively smooth, depending on steel type, surface profile, design shape and angle of exit.	Gas wiped and therefore generally smoother than general or batch type hot dip galvanizing.
Passivation	Components are water quenched where the water usually contains a small percentage of sodium dichromate. Although not quite yet fully used by the galvanizers, passivation treatments free of chrome 6 have been developed and are commercially available.	*Mill passivation:* A chemical treatment is normally applied to zinc coatings to minimise the hazard of wet storage stain. *Mill phosphating:* This is applied so that subsequent painting after normal cleaning can be relatively easily achieved. *Oiling:* This treatment method further prevents the formation of wet storage stain.

continued on page 14...

	GENERAL OR BATCH TYPE HOT DIP GALVANIZING	CONTINUOUS SHEET HOT DIP GALVANIZING
	PROCESS continued	
Testing adhesion	Testing of adhesion is not necessary in accordance with SANS 121.	In order to test the adhesion of a coating, a bend test and impact cupping test is conducted. See *#9.*
	DURABILITY	
Corrosion categories C1 to C5M (ISO 9223)	The corrosion of a zinc coating or a duplex coating system (hot dip galvanizing and an appropriate paint system) varies depending on the atmosphere the coating is subjected to, see table *#10* below extracted from ISO 9223, for a performance comparison between general and continuously hot dip galvanized sheeting.	
Enhanced corrosion protection	Iron/zinc alloy layers which make up between 50 and 85% of the coating provide up to 30% better corrosion protection than pure zinc.	Limited iron/zinc alloy layers due to process speed and requirements for final product ductility.
Cathodic protection at edges	Zinc by its nature because of its position in the galvanic series of metals will sacrifice itself in preference to carbon steel. Cathodic protection is relative to moisture content, coating thickness and the amount of zinc present at the uncoated area.	
Effectiveness of cathodic protection	More effective due to greater coating thickness and an intact coating at all edges.	More effective on thin gauges and thick coatings. Less effective on thick gauge and thin coatings, particularly along cut exposed edges.
Wet storage stain	Wet storage stain is a white voluminous deposit (zinc hydroxide) that is formed on freshly hot dip galvanized surfaces which are in close contact in the presence of moisture. Freshly galvanized coatings react with the environment until such time as the cause is removed and a stable zinc carbonate film is formed on the coating surface. See *#11*	
Effect of wet storage stain	The presence of wet storage staining will rarely have a marked influence on a thick general hot dip galvanized coating.	The presence of wet storage stain, in between closely nestled sheeting, will if not addressed early enough, lead to premature corrosion of the zinc layer.
Abrasion resistance	Pure zinc is a soft metal, even though it is harder than most organic coating materials. The iron/zinc alloys produced in batch or general hot dip galvanizing are however, very hard. In fact they are harder than ordinary structural steel.	
Superior abrasion resistance	The iron/zinc alloys provide superior abrasion resistance.	Less abrasion resistant than general hot dip galvanizing but better than most organic or paint coatings.
	PRODUCTS	
Appearance	Depending on steel type, coating appearance can vary from a spangle finish to a silvery or matt or even dark matt grey finish.	Different appearances ranging from a spangle coating, minimised spangle coating, iron/zinc alloy coating to a differential coating are offered. See *#12.*
Can appearance be altered?	Yes, the addition of a Zn/Ni/Al alloy can improve coating appearance.	See above.
Ductility	Not ductile, items must be completely fabricated before coating, generally excessive bending will cause cracking of the Fe/Zn alloy layer.	Ductile for subsequent profiling, as Fe/Zn alloy layer almost non-existent.
Component size limitations	Most fabricated steel items can be hot dip galvanized, provided they can fit into the respective galvanizing bath sizes. *#13*	Coils of sheeting, up to 1.5m wide, between 0.3 to 3.0mm thick and specified lengths.
Coating repairs	Site alterations and coating damage should be appropriately repaired. See *#14*. If not repaired, the uncoated area will suffer discolouration and eventually localised corrosion but corrosion creep is impossible while zinc is present.	
Are coating repairs allowable in terms of the standard?	Yes, at the galvanizer or at site, provided that an individual repair is no greater than 10cm^2 and the combined repair area on one component is not be greater than 0.5% of the surface area.	No mention regarding coating repair is made in either specification but if that is required, the same method of coating repair would be applicable.
For enhanced corrosion protection or individual specification requirements including a colour, hot dip galvanizing can be duplex coated by painting with an appropriate paint system.	Combining a hot dip galvanized coating with an appropriate paint coating system, results in a synergistic effect, whereby the sum of the individual coatings, can be increased by between 1.3 to 2.7 times the individual coating lives (depending on the specific environment at hand).	
	Specify the use of the Association's Code of Practice for Preparation, HDGASA 01-1990. Specification for the Performance Requirements of Coating Systems. HDGASA 02-1990. Engineering Specification, HDGASA 03-2006. Discuss with the Association and/or paint supplier. Preferably use galvanizer with in house industrial painting facilities.	Specify "Chromaprep" – Factory primed coated hot dip galvanized sheeting, ready for top coating. Specify "Chromadek" or "Chromadek Plus" – Factory painted top coats.

KINDLY REFER TO OUR WEBSITE AT WWW.HDGASA.ORG.ZA FOR NOTES 1 - 11

Duplex coated Lula pipe is used to successfully overcome corrosive water problems

EPNS Engineering Lula Pipe with Duplex Coating

Scope of works

A 24km 200mm diameter pipe line installation by HEMS Engineering using Twin Lula Piping to Dewater underground mining activity at Sasol Brandspruit mine in Secunda.

Lula which means easy in Zulu is a steel pipe rolled to plastic pipe sizes with integral socket and rubber seal ring (SABS 1182 mark). Using the same tried and tested socket system used by plastic piping systems, Lula piping draws on the strengths of steel making it a robust piping system that can be installed above the ground, which was done by Hems Engineering at Sasol's Brandspruit Mine. Lula piping has a pressure rating of 25 bars, is fire resistant, UV resistant and resistant to pressure surges.

For the external surface protection of the pipe, hot dip galvanizing proved very cost effective and is widely used in and around the plant and mines for corrosion protection of water pipes. It has the added advantage of not been affected to the same degree as plastic pipes when facing veld fires, which

occur annually in the area. Due to the acidic quality of the mine water as well as the threat of sulphur reducing bacteria it required the Lula Piping to be coated internally. Mike Book of Duplex Coating cc a specialist paint applicator in his own right provided the necessary expertise. The hot dip galvanized Lula Pipe was brush (sweep) blasted to achieve the correct surface preparation before the lining was applied. A 200 micron DFT coat of Interline 850 epoxy supplied by Plascon was applied. Plascon guarantees this system for 10 years. The first phase of the pipeline is currently in use. The completion of a further 12km line is scheduled for the end of October.

Guest Writer

Our guest writer for this edition is Darelle Janse van Rensburg of Orytech.

Performance testing of protective systems

Performance testing of materials, used as organic, duplex or metallic coating systems, has become a major luxury for many large organisations in South Africa. In the past 10 years or so, we have seen several sizeable performance testing facilities being either closed or down-scaled due to increasing financial pressures, change in business strategy and/or loss of technical staff. It is therefore not surprising that many companies have moved away from the in-house performance testing of these coatings, to outsourcing this function, or placing the risk on the contractor and his supplier to decide which product to use and in doing so, taking full responsibility for the performance of the coating.

The latter strategy may seem the right way to go, especially considering the lack of technical expertise and plant related experience that looks as if it is crippling most large organisations nowadays. However, the wisdom of such a policy can also be questioned, particularly considering that the final decision as to whether a contractor should be used or not, and often by direct implication, which material/coating will be used or not, may end-up becoming a non-technical person's responsibility, e.g. a buyer, whom, if not well trained or permanently on guard, may be duped by an unethical contractor into using a low quality material for a coating.

Long-term guarantees may offer some solution to this problem, especially if provided jointly by the contractor and his supplier. However, even though the performance and quality of a specific job may be assured, the question can be asked; Who pays for any consequential damages that may come about due to loss of income when plant operations need to be disrupted as a result of premature failures of materials?. Often these costs can run into millions of Rand, where the original job may have been only a fraction of this cost.

Certainly, having knowledge of the performances of products from a wide range of suppliers and being aware of what material will work in a specific plant or not, protects the end-user from being brainwashed or hoodwinked into utilising the incorrect coatings. In addition, it is important to realise that the performance and application qualities of products are often pushed to their absolute maximum, due to limited outage time, site-specific problems, incorrect planning, etc. Unfortunately, when problems arise, suppliers are not always in a position to provide all the answers.

For many years now we have seen organic coating material manufacturers being forced by stricter international legislation to develop more environmentally and user friendly products. In many countries, it is no longer acceptable to use high solvent content materials, and accordingly, we have seen a dramatic increase in the development of low volatile organic compound (VOC), solvent free, powder and water-based materials. However, it is important to realise that since most of the current research work is based around existing coatings, it is likely that excellence and durability may be traded for the sake of compliance. Although many of the new developments have ensured improved environmental, safety and health benefits, the disadvantages can often be linked to an increase in the difficulty of application or change in the long-term performance qualities of the materials.

Therefore, it is not surprising that based on experience; it has been shown that close to 40% of materials submitted for testing are rated as unsuitable for the intended application, especially if long-term durability is taken as a criterion, and of these, about 20% fail within the first year of service.

For this reason, and in summary, it is considered that performance testing of materials ensures,

- Decreased vulnerability for incorrect product application
- Long-term statistics and reliable information specific to plant
- Enhanced decision making power
- Performance results for Sub-Saharan Africa conditions

And reduces,

- Exaggeration of product performance
- Undue criticism of products
- Monopolies
- Corruption and contractual irregularities and,
- Exploitation of smaller suppliers.

In summary then, when considering materials of construction for corrosion control, hot dip galvanized carbon steel has been tested extensively under both laboratory and natural field exposure conditions and in many cases is used as a benchmark product. Based on years of accelerated and "real life" performance data one is able to predict the service life of this corrosion protection system.

Understanding quality control and quality assurance

Every owner begins their project expecting that the protection offered, be it by corrosion protection with anti-corrosive paints; hot dip galvanizing or duplex coatings, will be undertaken in a manner that will keep the project protected for a minimum period of time.

The owner relies on many different aspects to achieve the goal of having a successful project such as the specifications, contractors, quality control and quality assurance.
Though the words quality control and quality assurance may sound similar, they do have very different meanings and purposes. They are both important concepts, yet most project managers have only a vague understanding of the meanings and the differences between the two terms which could turn out to be very costly to them.

In order for you to manage the quality of your project, you would need to know the quality expectations of your client.

Defining quality control and quality assurance

Dictionary definitions

Control - *Verb*

- To exercise restraint or direction over; dominate; command.
- To hold in check; curb.
- To test or verify by a parallel experiment or other standard of comparison.

Assurance - *Noun*

- A positive declaration intended to give confidence.
- Promise or pledge; guaranty; surety.
- Full confidence; freedom from doubt; certainty.

ISO 9000 definitions

Quality control
The *operational techniques* and activities that are used to fulfill requirements for quality

Quality assurance
All those planned and systematic activities implemented to provide *adequate confidence* that an entity will fulfill requirements for quality.

continued on page 18...

As time has progressed, owners, consultants and contractors have become more aware and have started moving to the concept of a total quality system involving a clear division between quality control and quality assurance responsibilities.

There is a realisation that while third party inspection is still necessary (*not always necessary for hot dip galvanizing* [#1]) it is not intended for the owner's inspection to replace quality control by the contractor.

This message is not always stated in the initial specifications resulting in the quality assurance persons, continuing to provide the primary role of inspecting and accepting the work.

When the roles are not clearly defined there is a loss of a total quality system which often creates a confrontational position between quality assurance personnel and the contractor.

But, if the person responsible for quality control and the person responsible for quality assurance understand and perform their individual roles during the project, the quality at the end of the project improves.

Quality assurance

This refers to the process used to verify that what has been reported by quality control is correct and factual. It is a type of audit function which verifies that quality control is in fact being performed and that it is being performed correctly. For example, the quality control inspector should review the documentation of tests done and duplicate the inspection at certain hold points on the project to verify that the results reported by the quality control are accurately reflecting the quality of work.

Quality assurance includes the review of quality control documentation, physical spot testing and periodic testing and is typically performed by the owner or a third party inspector appointed by the owner.

Quality assurance is the determination of the processes that will determine the template and pattern of quality control tasks and is meant to verify that the quality control implemented by the contractor meets the requirements of the specification, to further assure a quality final product.

This can be a full, part-time or it can be performed at certain stages of the project process to ensure the adequacy of the contractor's quality control.

Quality control

This is the performance of the necessary observations, testing and documentation that verifies that the workmanship performed meets or exceeds the minimum standards established by the project specifications. It involves the routine and systematic inspections and tests that are conducted to verify that each phase of the work is in compliance with the specification. Quality control is the contractor's responsibility. It is also the first step in the total quality process.

Quality control activities are focused on the delivery aspect and makes sure that the results are what the owner desires.

Quality control by the contractor is meant to provide in-process verification that the tasks such as cleaning, preparation and coating is being performed as it was designed to as per the specification ensuring a quality final product.

This is a full-time requirement and has responsibilities for every aspect of the surface preparation and coating (*either with protective paint coatings, hot dip galvanizing*[#2] *or duplex coating systems*) process.

Quality control is more than the performance and documentation of inspections. The process includes procedures for verifying that specifications, product information and revisions are communicated to the job site, verifying that the equipment and the standards employed to perform the quality control are functional, correct and traceable and procedures for

METAL-PRO MARKERS

Steelwork contractors generally require temporary identification of the parts of a component when fabricating and often use incorrect methods such as oil based paint or inappropriate marking pens. If the galvanizer identifies the presence of oil based paint markings prior to hot dip galvanizing, he may be able to adequately clean it off. Cleaning sometimes includes extensive grinding of the surface in order to remove the marks due to the acidic nature of some oil based paint markers.

The Association has identified the "Metal-Pro Galvanized Steel Marker" as an appropriate method of steel marking, which will easily be removed during the process and has a number of these pens available for purchase.

Metal-Pro markers retail at R39.15 each excluding VAT. Kindly contact the Association in Johannesburg, should you be interested.

documenting and resolving deviations, nonconformances and corrective actions.

Both quality control and quality assurance are necessary components to verifying specification compliance and quality workmanship. We must remember that the presence of the Owner (or third party inspector) performing QA on a project does not relieve the contractor of the responsibility of performing QC.

We must remember that only the quality control has the authority to direct the contractor's employees or production operations unless the contractor was required to use a 3rd party quality control representative who is not an employee of the contractor.

If an Owner performs his own quality assurance, he then has a contractual relationship with the contractor and therefore exert control through the contract or by withholding payments or stopping of work when operations or conditions are non-conforming.

Should the Owner employ a third party quality assurance, then the third party quality assurance does not have a contractual relationship with the contractor; therefore they can only advise and document the non-conformance of the contractor's operations and advise the contractor's quality control or the owner. Should the contractor fail to correct the non-conformance, the owner must decide whether to stop work, withhold payment/retention, accept the non-conformance or take other action.

The only way in which the full benefit of the total quality management process can be realised, is through the establishment of clear qualifications, responsibilities and documentation requirements for both quality control and quality assurance on a given project. This will reduce conflicts, avoid duplication of documentation and inspection and most importantly, offer long lasting protection of the structure or asset.

#1 If essential third party inspection is required it is imperative that the third party coating inspector be adequately qualified to understand the reasons for compliance and non-compliance – see the Association's Coating Inspectors Course),

#2 The hot dip galvanizing process, is controlled by a metallurgical principle between molten zinc and heated steel, should the steel not be cleaned of all contaminants, such as millscale, grease, etc. the reaction will not take place, resulting in obvious uncoated areas. It is for this reason that hot dip galvanizing has become to be known as the "Honest" coating. If the coating looks good, it is good!

Additionally, most galvanizers are part of the SABS mark scheme, where if requested by the customer prior to ordering and the steel components conform to SANS 14713, they are entitled to issue a SABS Certificate on the applied coating.

The Association wishes to thank Mike Book for this contribution.

Duplex systems and why they are necessary

Hot dip galvanized steel is painted for several reasons.

1) In highly aggressive environments it is necessary to provide a superior corrosion resistant coating by applying several coats of appropriate paint. Any structure within one kilometre of the sea front can be classified as being in an aggressive environment. This environment will be discussed later in this article.
2) Galvanizers may consider the zinc coating to be reasonably decorative but for many it may be necessary to provide a more decorative colour scheme especially in retail and high profile areas.
3) For safety reasons it may be necessary to overcoat the hot dip galvanizing to warn of potential dangers such as in aviation and traffic, railway structures, light houses, beacons, cranes and towers.
4) It may be important to camouflage the structure or to ensure it blends in with the countryside to appear less obvious, and aesthetically more pleasing.
5) Structures that are inaccessible for maintenance require extra long duration of protection against corrosion. Examples of these could be underground mining, jetties in marinas and harbours or stadium roofs in soccer and rugby grounds. Many other examples could be categorised here.


Inaccessible areas.


Proximity from the sea.

Atmospheres are usually classified as rural, urban, industrial or marine or a combination of these. In rural and urban conditions hot dip galvanizing rarely requires painting as the zinc coating will provide a remarkable corrosion free lifetime. In industrial areas where pollutants such as sulphur dioxide and nitrogen dioxide are present it may be necessary to paint the hot dip galvanized steel to prevent attack by "acid rain" in the form of moisture combining with the pollutants. Heavy rainfall is beneficial to surfaces as it washes away pollutants while soft rainfall may merely wet the surface and accelerate the corrosion attack. This condition is very important for salt deposits from the sea as for example in the Western Cape, rain is prevalent from the North West and provides relief on one side of steel structures. However the prevailing wind is the South Easter which is responsible for severe salt deposits all over the peninsula on the other side of the structure. No rain originates from this wind and structures on the east coast sea front are subjected to a salt spray battering with very little wash down cleaning and subsequent removal of the salt deposits.

Due to heavy wave action off the coast of the majority of South Africa, chlorides are dispersed several kilometres inland by strong prevailing winds.


Note the wave action.

Decorative duplex coating.

Relative humidity and "time of wetness" are further factors that will promote corrosion of steel or zinc especially combined with the presence of chlorides in humid air.

Time of wetness has a significant effect on the life of a hot dip galvanized coating especially combined with chloride deposits. Full exposure to sunlight has a direct effect of reducing corrosion while permanently shaded surfaces will corrode far quicker as they can remain damp for much of the day.

In all the conditions mentioned above a superior duplex system could be considered essential. Hot dip galvanizing or painting on their own may not provide the lifetime required but a combination provides a synergetic effect where the sum of 1 + 1 = 3.

Other environments that require duplexing would be in salt water, corrosive fresh waters and certain soil types especially underground in some mines.

One side of the sign post, due to the full sun has no corrosion.

One side of pole the hot dip galvanizing is totally corroded due to a combination of sea salt, moisture and lack of drying from the sun.

We also recommend where hot dip galvanizing is partially cast into concrete or is fixed onto concrete that the surface of the hot dip galvanized coating is painted to prevent differential aireation and possible crevice corrosion especially in moist marine conditions as these areas tend to remain permanently damp.

Superior duplex systems are 2 or 3 coat paint systems applied onto carefully cleaned hot dip galvanized coatings. The closer to the sea the greater the total dft of the paint system, i.e. in aggressive marine conditions, the total organic coating over hot dip galvanizing should be at least 150µm DFT, to prevent early breeching of the paint and the formation of zinc oxides and hydroxides.

By Iain Dodds of Cape Galvanizing.

Like Michelangelo, we should be smart when it comes to arguing

Michelangelo was once asked by the Mayor of Florence to work on a huge block of fine marble, which had been previously damaged by an unskilful sculptor. No other sculptor, including Leonardo da Vinci, would touch the marble, saying it was totally ruined. Like the genius he was, Michelangelo knew he could adapt the pose of the human figure he would create, using a bending-over posture, so that the marble could still be used to great effect.

Nearing completion, the Mayor visited Michelangelo to view the piece of art. While agreeing that it was indeed a great work, he had some misgivings about it. Fancying himself a bit of an art connoisseur, he believed the nose was too big and it should be made smaller. Michelangelo realised that the Mayor was viewing the sculpture from a wrong perspective and from this angle was not seeing the face properly.

Without hesitating, Michelangelo invited the Mayor to accompany him up the scaffolding around the sculpture. Reaching the nose, he began gently tapping his chisel on the nose, at the same time releasing some marble dust that he had concealed in his hand. He did nothing to the nose but gave the appearance of making it smaller. The Mayor was impressed: "that looks so much better, I knew I was right, it has come alive", he stated. "You're a great sculptor Michelangelo."

Michelangelo was a supreme diplomat. He knew changing the nose would ruin the sculpture. But, he did not want to upset his patron, who prided himself on his artistic judgement. He knew too that if he upset the Mayor he would not receive any further commissions. By taking him up the scaffold he changed the Mayor's viewing angle and, without telling him, did not make him aware of his misperception when viewing sculptures. By not arguing, Michelangelo was able to retain his work for posterity and at the same time enhance his standing with an important client by making him think it was his idea. For after all, who else was able to improve the work of Michelangelo?

We all love to argue; politics, religion, sport, cars, marriage, crime, economics, etc.: there's not much we don't argue about at dinner parties, in the pub, at the office, at home, wherever. Whenever there are more than two people, we argue and even argue with ourselves. In general, an argument is 'a discussion involving conflicting points of view' (Wikipedia), which on its own is part of our life: it seems we are born to argue. Often, however, it is not the argument as much as the language we use, the impact of the language on the arguers and that we seldom seem to resolve our arguments. My point of view is mine, yours is yours and you and I will stick to our opinions come what may. Even if we 'agree to disagree', this just means for now; we will start the argument when we meet again and, just for spice (or perhaps spite) usually add some extra opinions to the argument pot.

We must, however, not confuse the form of arguing we are talking about with what we can perhaps call, 'philosophical argument', the science and concept of which emanated from the ancient Greek philosophers, like Socrates. Here, arguments are used, with or without empirical evidence or general observations, to establish a convincing conclusion about various issues. In this vein, an argument has an internal structure, comprising of a set of agreed assumptions or premises, a method of reasoning or deduction and a conclusion or point. An argument must have at least one premise and one conclusion. Regrettably, this is not how we tend to argue: we don't agree on the basis of our argument- we just have our firm beliefs, we don't normally reason or deduce-we just state what we think is true and we seldom get to a conclusion.

Like Michelangelo, we should be smart about arguing. We should recognise and acknowledge the party(ies) with whom we are arguing, understand what effect our arguing will have on ourselves and on others and be careful of the language we use. Sure, arguing as we know it is part of socialising and it's fun and often does no harm. But there are many other occasions where perhaps we should be more philosophical. This may not sound like too much fun but it can be a valuable way of acquiring and sharing knowledge and will not have any harmful effects.

The Association wishes to thank Bob Andrew who is a consulting value engineer and honourary member of the Association for his article. He can be contacted on anneve@iafrica.com or boband@mweb.co.za

Measuring coatings on metal substrates (Part 2)

BUSH PRESENTATION

On the occasion of a recent query with regards to hot dip galvanizing, the opportunity existed for conducting an impromptu bush presentation to the parties involved.

What influences the reading?

Obviously, the thickness of the coating changes the gauge's reading. There are other variables too and they must be controlled through calibration.

Substrate, shape and surface

Metals have conductivity and magnetic permeability, some more than others. Sometimes these change if the metal is heated and cooled. It is always necessary to calibrate to a similar piece of metal as the substrate of the sample.

The curvature of the sample influences the reading. A convex surface effectively bends away from the centre of the probe. This makes the reading higher than that on a similar flat surface. In a concave, the side of the probe is closer to the surface and the reading is reduced. That is why it is necessary to calibrate to a similar shape as the sample. N-type probes are affected more than F-type.

Rough metal substrates increase the reading of a probe, particularly for nonmagnetic metals. The eddy-current circulates below the valleys so the peaks of the roughness act as an extra coating. Calibrating to a similar surface roughness can correct for this, though other techniques can be used too.

The graph (right) demonstrates how the coating thickness reading can change if the dry film thickness or coating thickness instruments are calibrated on smooth, flat surfaces.

Setting the gauge

The process of calibration adjusts the readings of the gauge so actual thickness values are displayed. This process will be repeated each time a different sample is to be measured.

There are two setting points, one on a standard thickness of plastic and one on the bare metal. The same can be done at two different thicknesses to improve readings over a smaller range. Intermediate thickness standards will confirm the readings over that part of the scale.

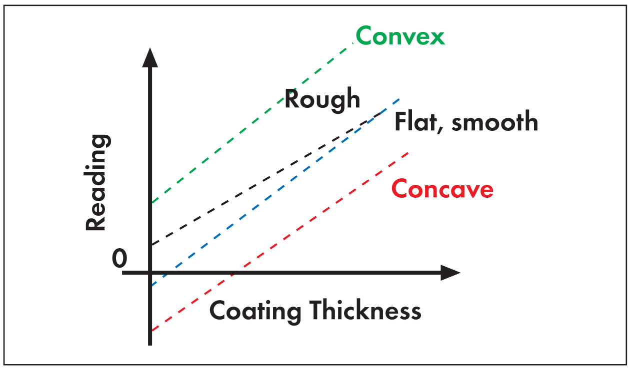
Scatter

Rough surfaces are generally uniform, but mechanical damage is random. If there were only one reading on a sample, a dint in the substrate could distort it and the reading would not be representative. It is always better to take 10 readings over an area and to calculate the average value because this result is more repeatable than a single reading. The Elcometer 456 gauges can automatically average results making this a simple procedure.

Repeatability

Accuracy is often less important than consistency. As an example, consider a table. If all the legs were 2mm short, the table would function perfectly. But if one was wrong by 1mm and three were right, the accuracy would be better but the table would not be stable. Consistency is necessary especially if more than one gauge is used. Similar calibration to the same standard and readings taken in the same way will ensure this.

This article is the second part of six, kindly supplied by BAMR, suppliers of coating thickness instruments.



NOW WITH CPD POINTS

Galvanizers Inspectors Course

Hot dip galvanizing is one of the most widely used methods of protecting steel from corrosion. As a final step in the process, the hot dip galvanized coating is inspected for compliance with the appropriate specifications.

This Galvanizers Inspectors Course has been designed to provide delegates with sufficient knowledge to test, inspect and interpret test results.

Following the course and successful result in a three-part exam, the delegate will be issued with a certificate, and if required, registered as an approved HDGASA inspector. Registration will be confirmed on an annual basis. Successful inspectors will become Individual members of the Association for the year.

The course is usually run from the Hot Dip Galvanizers Association in St Andrews, Bedfordview but from 2009 it will be available in Cape Town. Bookings are limited to 10 people on a first-come-first-serve basis.

COURSE CONTENT

- Introduction to corrosion
- Understanding zinc coatings
- Inspection before hot dip galvanizing
- Inspection after hot dip galvanizing
- Quality assurance in coating applications.

COURSE DURATION

This is a 2-Day Course comprising lectures on the first day, a Plant Tour in the morning of the second day, and the qualifying examination in the afternoon.

DATE AND TIME

Courses commence at 08h00 sharp and end at 16h30, on the following dates in 2009: February 10 - 11; April 7 - 8; June 9 - 10; August 4 - 5; October 6 - 7 and Nov 24 - 25. Cape Town will host a course in March and September.

Lunch and refreshments will be provided. Comprehensive course notes can be collected from our offices two weeks before the course.

COURSE COST AND PAYMENT TERMS

R2 394.00 per person inclusive of VAT. Should you have 2 or more delegates from the same company, course costs will be R2 166.00 per person inclusive of VAT. Please note that payment is due on the first day of training. Cheques to be made payable to "Hot Dip Galvanizers Association SA". Members qualify for a discount.

SHOULD YOU BE INTERESTED, KINDLY CONTACT SASKIA SALVATORI AT THE ASSOCIATION.

NOTE: All professional Engineers, Technologists, Technicians and Certificated Engineers are required to achieve a certain number of points for Continuous Professional Development (CPD). By attending the Association's two day Coating Inspection Course, you will obtain 2 points (accredited by ECSA).

Charlene Bossert of Bulldog Projects passes NACE

Hi Terry,

Thanks for the congrats, although I have a feeling that I owe a lot of the success to the lecturer's Bruce Trembling, Neil Webb and Mike O'Brien who sacrificed a lot of afterhours time to ensure that the attendees had a full understanding of course material.

The corrosion industry is a very complex industry. From my past experience I have seen it through the eyes of the coatings manufacturer (Plascon 6 years) and the applicator (Duplex coatings 2 years) and now that I have written the courses, I understand the different and very important roles that each party plays.

I believe from the Corrosion Institute that I am the first female in South Africa to pass NACE - Peer Review.

You will be glad to know that we covered Hot Dip Galvanizing in the NACE CIP 2 Course which I found extremely interesting, so I am really looking forward to doing the Hot Dip Galvanizing Inspectors Course in November.

Writing all three NACE courses in one year has been tough but exhilarating, and I am really looking forward to the new year when I can put all that I have learnt into practice.

Yours in Corrosion Protection,

Charlene Bossert
Duplex Coatings.

Galvadip has their 25th birthday!

The Galvadip Team left to right top - Hans van Wyk; Marco Barnard; Heike van Eijden (MD); Derek Garvie; Owen Stanton and below Nico Swanevelder and Tim van Eijden.

Founders: Eric Genders (deceased), Geoffrey Gass (deceased) and Bill Garvie.

Galvadip commenced business twenty-five years ago in Pretoria. Bill Garvie worked with Walter Barnett at Rietfontein Galvanizers in Johannesburg for many years prior to starting this venture together with his partners, Eric Genders and Geoffrey Gass.

Although there were doubts about the project's chances of success, the three men persevered with their vision starting with a 6,5m long bath in Mundt Street, Waltloo.

Production started in September 1983 with a single shift and in 2002 a double shift was added to cater for increased demand. Sadly by then Bill's partners had unexpectedly passed away. Bill continued to run the plant together with a capable team of managers and a well-trained workforce until he retired late in 2005.

The company was bought out by an MBO headed by Mrs. Heike van Eijden, who took over as managing director.

Galvadip, has since rapidly expanded with a third shift and second galvanizing line of 7.0m x 2.5m x 1.5m.

Both lines are now working a 24-hour shift and tonnage has tripled. There are now 220 employees.

The company has a reputation of producing some of the best quality in the industry, a fact of which the shareholders are very proud. The industry has also taken note of these high standards responding with a number of awards from the annual Hot Dip Galvanizing Awards event.

Guard rails on the Kamanjab - Omagange Road in Namibia

Ensuring that hot dip galvanizing will stand up to its reputation for long term corrosion protection, Association staff will passionately pursue any opportunity to eliminate unnecessary misconceptions and disputes.

As part of the association's effort to educate and improve the frequent ineffective communication between end clients and the galvanizer, often via a number of contracting parties, the specifiers finish expectations and the manufacturer and galvanizer's commitment to the quality of the final product, etc. we include for your reading, this report by the Association.

The Hot Dip Galvanizers Association was requested to inspect the hot dip galvanized coating on certain guard rails in Phase 1 and 2, on the road between Kamanjab to Omagange, Namibia.

Sponsored by the manufacturer, I flew to Windhoek and then accompanied by the supplier, drove about 500km North of Windhoek, where we over nighted in Kamanjab and drove a further 80 km in the morning to the site. I report as follows:

Unless specifically requested for other reasons, hot dip galvanizing is normally specified primarily for corrosion protection. For this reason, the two most important inspection criteria of hot dip galvanizing are coating thickness and coating continuity.

Coating thickness

A number of coating thickness readings were taken at numerous locations indicating an upper coating thickness of 88µm, a minimum of 47µm and a mean of about 70µm. Although in excess of the minimum coating thickness required by the SANS 121 (ISO 1461) specification, the coating thickness is acceptable.

Photos 1 and 2 above show the installed and about to be installed guardrails on the road from Kamanjab to Omagange, Namibia.

Photo 3.

Photo 4.

The specification requires that for steel thickness equal to and greater than 1.5mm but less than 3mm thick, the local coating thickness is to be a minimum of 45µm with a mean of at least 55µm. The guardrail material is 2.6mm thick.

As life of a zinc coating, no matter how applied is more or less proportional to its thickness in a given environment, the thicker coating will provide a substantially longer life than a thinner coating.

Coating continuity

Apart from some coating damage as a result of insufficient appropriate packaging particularly when items such as these are transported over huge distances, some uncoated areas as a result of lumps and bumps being removed by mechanical damage and some zinc ash deposits, the coating

continued on page 28...

Photo 5.

Photo 6.

Photo 7.

Photo 8.

was continuous and acceptable in terms of SANS 121 (ISO 1461).

Mechanical Transport Damage

Photos 3 and 4 show mechanical coating damage, which occurred on some guardrails.

Lumps and bumps and mechanical damage

Photos 5 - 8 show some lumps of zinc residue/dross, which have been knocked off, possibly during transport, leaving some mechanically damaged areas, where the residual iron/zinc alloy layer measured to be about 10.9µm. *Photo 6* also shows the typical coating thickness adjacent to the damage (69µm).

Photo 11.

Photo 9.

Surface ash on the guardrail surface

Photos 9 and 10 show surface ash deposit that is scrapped and coating thickness measured as 471µm.

Coating at surface contaminant or touch mark

Photo 11 shows a thin uncoated area of about 1m long due possibly to some residual contaminant or the effects of a touch mark, along the crest of one of the installed guard rails. If deemed necessary the roughness adjacent to this surface condition can be mechanically cleaned but ideally it should be left alone. The uncoated areas along this mark were too narrow to measure the coating thickness with the standard instrument.

Photo 10.

Superficial black marks on coating

Photos 12 - 14 show some superficial black marks, that have been cleaned and the coating thickness measured, (74µm).

Wet storage stain (white rust)

Although not necessarily a reason for complaint in this instance, wet storage stain is not a reason for rejection in terms of SANS 121, unless specifically excluded for aesthetical reasons.

Refer to the Association's Information Sheet No. 2 for more specific information on wet storage stain.

Coating thickness in all instances that were measured were in accordance with SANS 121, *see photos 15 - 17*.

Photo 12.

Photo 13.

Photo 14.

Photos 15 - 17 (above from left to right) show an end piece guard rail with wet storage stain, its subsequent removal in two areas and the residual coating thickness..

General comment

In many instances welding has taken place where it was felt that certain components might in future be stolen from the guardrails. The coating in these instances should be repaired, *see Coating Repair Procedure covered in Information Sheet No. 12.*

Conclusion and recommendations

Generally, coating repairs at damaged areas, such as those mechanically damaged from transport conditions, contaminant or touch marks and all subsequently welded areas should be repaired, using a reputable zinc rich paint or epoxy.

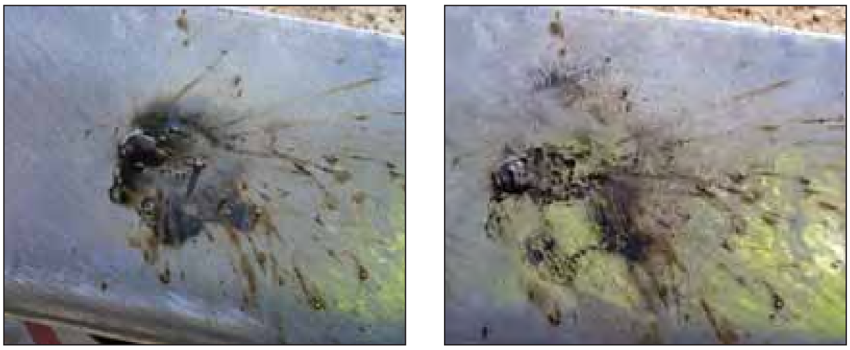
In terms of the extremely slow corrosion conditions at hand, suggests that the area is a C1 category see table extracted from the ISO 9223 specification. If coating repairs were not effected the long term effects would be negligible in terms of surface corrosion. Some surface discolouration may occur in time but corrosion creep under the surrounding coating is impossible with a hot dip galvanized coating.

Coating repairs may be carried out using a reputable zinc rich paint, which is normally packed in 1 to 5 litre containers. One or two coats of this product after surface preparation will prevent surface discolouration in the long term.

Other than the mechanically damaged areas caused by the removal of surface lumps and inappropriate loading and transportation of the guardrails over long distances, the hot dip galvanized coatings on the guardrail is acceptable in terms of SANS 121. Coating repairs may be effected but should this not occur, failure of the hot dip galvanized coating is unlikely due to the extremely slow corrosion rate of zinc in the atmosphere at hand.

In the interests of the customer at hand and in the event that coating repairs are deemed to be necessary, it may be appropriate if the manufacturer provide a container of single pack zinc rich paint, for the damaged areas mentioned in the above report.

Terry Smith



Photos 18 (above left) shows the weld mark as is, photo 19 (above right) shows all welding residues removed by scrapping.

Photo 20 (above left) shows the coating thickness adjacent to the weld and photo 21 (above right) shows the coating thickness at weld area. Welding has visibly reduced the coating thickness.

On the couch with

Jeremie Malan

Jeremie Malan of Jeremie Malan Architects was born and bred in Pretoria. He attended Afrikaans Hoër Seunsskool in Pretoria and also studied Architecture at the University of Pretoria. Jeremie explains his career choice as an "instinctive knowing" since the age of 5. He remembers playing on the family farm and constructing little houses out of sticks and mud. The family, although being farmers, had a creative streak. Jeremie's paternal grandmother was an artist and his father who, despite being principally a farmer, had a keen interest in Landscape Architecture.

The Malan clan still call Pretoria home and comprises of Maré, an artist and office interior designer who inputs in all the firm's buildings from space planning to detail design and choices of finishes and furniture. Cillié (26) is an architect and also works for Jeremie Malan Architects. (He was awarded the Corobrik Best University Student Award for 2005 and also awarded the Sasol Best Young Artist Award in 2006.) Phillip (22) is a commercial pilot in Namibia and pilots tourists to game lodges in desolate but wonderful parts of Southern Africa. And "laatlammetjie" Maria (10) is at primary school and loves animals, friends, piano, theatre, art, school and Hannah Montana!

True South African architecture to me is unfortunately non-existent; but regional, historic and ethnic styles exist. These though are far apart not only regarding national symbolism but also in the use of materials and the response to site, topography, climate and the cultural background. I find that this multi

faceted background stimulates creative and diverse styles which contribute to a rich visuality.

I find inspiration in well planned, accurately detailed, well proportioned and well constructed buildings such as The Eiffel Tower, Centre Pompidou, Chapel Ronchamp, Guggenheim Bilbao, Lloyds London, Sydney Opera and The Union Buildings.

My company Jeremie Malan Architects specialises in libraries, hotels and storage facilities (depot's, archives and warehouses).

The professional achievement I am most proud of is the completion of *The New National Library of South Africa* in Pretoria which spanned 17 years from inception to handover. The first 10 years were used to determine suitable sites and to refine a brief for the new library. In 2001 we were appointed to conclude with a proposed site and a design concept. Thereafter our appointment was extended to detail and construct the building which was completed in August 08.

Hot dip galvanizing to me is a versatile method of utilising steel in buildings by ensuring long lasting and good quality finish for a base material (steel) which is prone to problems.

We use this coating often because it is maintenance free but also provides versatile options in the design process.

A prime example of the application of hot dip galvanizing in one of my designs is The New National Library of South Africa. We used an external hot dip galvanized steel structure to provide sunscreen and covered walkway elements. This allowed us to experiment with lightweight and highly suitable architectural elements on the facades providing the necessary shade but allowing the structural freedom of a steel structure. The hot dip galvanized finish provides an economic solution for a modern, expensive façade.

I choose to live in South Africa because I was born here with a family history spanning over 300 years. I believe that this history must continue and my contribution must not only help sustain our country and serve its people but also compliment the legacy of the many people who have lived here and who have contributed to a beautiful country.

When I leave the office I go home, read the newspaper, listen to Mozart and talk to my family.

Jeremie Malan Architects can be reached on 012 460 5388 / malanarc@mweb.co.za

The Association wishes to thank Desere Strydom for this contribution.

Bread bakery exchanger coil investigation

"Wamosha" which in Zulu means inappropriate use, misuse or messing about, has replaced the words, "Galvanizing Failures". This column will feature articles where we find hot dip galvanizing or where other zinc coatings that are often inappropriately specified when general hot dip galvanizing is preferred, have been inappropriately used.

Following a request for the Association to conduct a site inspection of hot dip galvanized heat exchanger coils in a bread baking cooling chamber, the following report is an analyse of the causes of the apparent failure of the corrosion control system.

At the time, it was reported that two separate bread cooling installations had been commissioned approximately 12 months before the said site inspection. Of these two installations, one had shown serious signs of corrosion to the point where refrigerant had leaked, resealing and re-gassing had to be undertaken. This particular installation was non-operational during the visit as it was reported that a further leak had been encountered followed by re-sealing and a pressure test. Re-gassing was to be completed before re-commissioning.

Inspection of both installations revealed severe corrosive attack of the coils and fins of the non-operational

continued on page 32...

Corrosion evident on the coil fins on the inside face of the bread cooling chamber. Note the corrosion evident on every second pipe within the heat exchanger, with corrosion of the fin in contact with the corroding pipe.

Corrosion evident on the coil end of the non-operational coil.

Little evidence of corrosion on the coil end of the operational installation.

installation, while a brief inspection of the second installation (operational coil) showed limited corrosion. The photographs above and below illustrate these initial findings.

After reviewing this initial evidence the question arose as to why the difference in performance between the two installations? What were the differences between the two?

The major difference, illustrated in the photographs below, is the presence of the small refrigerant feeder pipes shown on the corroding coil. These smaller feeder pipes consist of copper, which are "electrically" in contact with the hot dip galvanized (zinc) pipes of the heat exchanger. It must be remembered that when the installation is in operational conditions, condensation is present at the "hot" face (inside the bread cooling chamber) and at certain parts of the coil ends. This wet condensation will provide the electrolyte in which will be found the corrosive elements from the environmental atmosphere of the bakery.

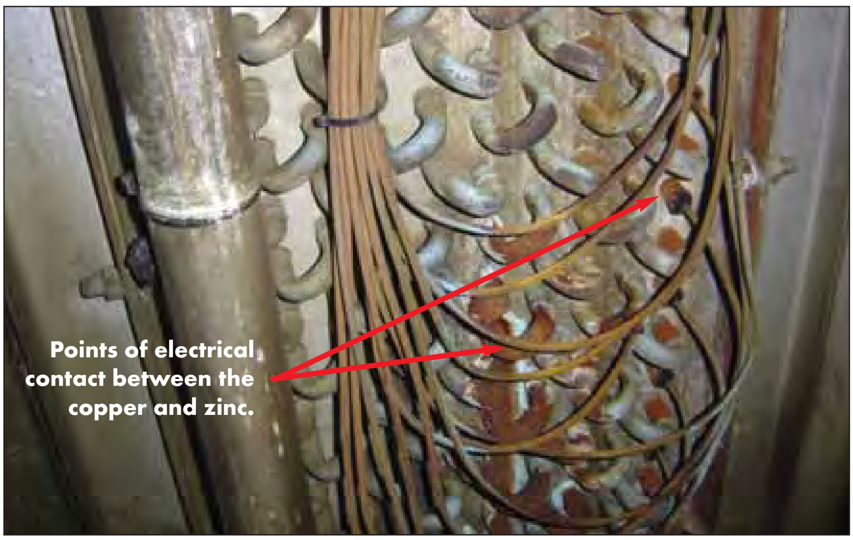
For corrosion of this coil to take place we need 4 components to be present, i.e. an anode, cathode, an electrical contact and an electrolyte. All four components are present in the installation.

1. Anode, the zinc of the coil tubes and fins.
2. Cathode, the copper of the small feeder pipes.
3. The copper and zinc are electrically connected at the junction of the copper pipes at the ends of every second zinc coated coil pipes, plus where the copper pipes touch the outside of the coil zinc coated pipes.
4. An electrolyte that is provided by the condensate with corrosive elements contained within the bakery environmental atmosphere.

With all four of these elements present, one will experience what we call galvanic corrosion, also known as bi-metallic corrosion or a bi-metallic couple.

One will immediately ask why this was not the case at the fully operational installation?

In order to answers this very questions, a return site visit was arranged in order to re-examine the 'good' coil. However on this visit we went to the opposite end of the heat exchanger coils, i.e. to the end where the smaller copper pipes were located. The photographs shown right, illustrate what was found. A similar situation to that taking place on the problem installation and one that would ultimately result in a similar outcome to that was evident at the non-operational installation.



Copper pipes in "electrical" contact with the zinc coated pipes (welded junctions) and where the copper physically touches the zinc coated pipes. Note the greenish colour (possibly copper sulphate) of corrosion products, which suggests the presents of sulphur in the atmosphere and therefore also in the condensate (electrolyte).

It is noteworthy that severe corrosion was taking place on every second pipe of the coil, both at the coil ends, where the copper pipes were attached, and also on the fins, inside the cooling chamber.

Severe corrosion is taking place on every second pipe of the coil at both coil ends where copper pipes are attached.

Conclusion and recommendation

What both installations exhibited was a classic case of galvanic corrosion due to a miss-match of materials of construction, i.e. copper and zinc. The zinc, being electronegative to copper, will be the anode and it will sacrifice itself to protect the copper cathode.

It was recommended that consideration be given to a redesign and replacement of copper with hot dip galvanized (zinc coated) refrigerant feed pipes. In addition, it is essential to insure that no copper is used "upstream" of the zinc coated materials as copper contaminates can "wash" down and react with the galvanized pipes.

The above represents a summary of the site investigation, findings and recommendations. Many forms of material failures can and are traced to inappropriate materials selection at the design stage of a project. The above material failure could have been prevented by some corrosion science knowledge.

Bob Wilmot

MISCONCEPTIONS

Miss Conception puts it "straight"

"Miss Conception" rectifies incorrect impressions concerning hot dip galvanizing.

The world is running out of zinc.

True or false?

From time to time, some with little knowledge of zinc mining claim the world "will run out of zinc" in the next few decades. Nothing could be further from the truth.

The fact is that despite greatly increased consumption of zinc produced from ore in recent years, increases in zinc ore reserves and the ore reserve base have grown more than this increased consumption, and there is more zinc available to the world today than at any other time in history.

If the doomsayers were right, we'd be running close to empty now – but they were wrong!

The doomsayers take the view that the way you measure the remaining life of zinc ore reserves is to take present reserves and divide that by annual mining production to yield years left. That static, alarmist, analysis is wholly belied by the objective facts.

The International Lead Zinc Study Group (ILZSG)[1] reports 6 798 000 metric tons ('mt') of zinc mined worldwide in 1994 (*ILZSG Bulletin, Feb. 2008, Table 56*). According to the U.S. Geological Survey (USGS), in 1994 the world's zinc reserves[2] were 140 000 000 mt (*Mineral Commodity Summaries, Jan. 1996*).

Therefore, assuming that everything had stayed the same from 1995 through 2005, the world would have mined an additional 75 009 000 mt of zinc, leaving reserves of only 74 869 000 mt. In other words, over half of the 1994 reserves would have been erased – forever – and the world would be looking at approximately 11 more years of mining until all the zinc reserves were gone – forever. But that is not what happened.

As distinct proof, the USGS reports that 2005 zinc reserves were not 74 869 000 mt as the doomsayers would have had it, but were instead 220 000 000 mt – a 57% increase over the 1994 level and approximately triple the doomsday scenario[3] (*Id., Jan. 2007*).

Despite increased mining, reserve levels continue to increase

Mining actually increased significantly in recent years. In 2006, according to ILZSG, 10 469 000 mt of zinc were mined worldwide – 53% greater than the amount mined in 1994 (*ILZSG Bulletin, Feb. 2008, Table 56*). Despite this steady increase in the amount mined annually since 1994, reserves still increased by over 50%, wholly undercutting the shortage argument. Thus, the argument that the world was running out of zinc on a static model was wrong, and the notion that the world is running out of zinc because of increasing consumption is wrong, too.

Improved commodity prices are responsible for a good bit of the new reserves

It is a given that profitable operations make more money available for exploration and development. And it is also a given that mineral commodity prices were depressed for a good bit of the last ten years. For example, in 2002 the average zinc price on the London Metal Exchange was $778.38 mt (*USGS, Mineral Industry Surveys, Zinc, Table 1, Oct. 2003*). In 2006, by contrast, the average price was $3 274.42 (*USGS, Mineral Industry Surveys, Zinc, Table 1, Dec. 2007*).

As a result of the low price for zinc and other metals, exploration budgets suffered. "Driven by surging commodity prices, 2005 expected expenditures for mineral exploration reached a level not seen in nearly a decade, according to findings in the May 2006 edition of the Society for Mining, Metallurgy and Exploration's (SME) Mining Engineering." (*National Mining Association, Mining Week, May 26, 2006*). And this continued in 2006:

"Metals Economics Group's (MEG) analysis of 2006 worldwide exploration budgets shows an increase to US$7.5 billion this year – the fourth consecutive yearly increase since the bottom of the cycle in 2002…"

"Years of stagnant and declining metals prices in the late 1990s and the resulting lack of exploration and mine development…" (*Commodities Now, Dec. 2006, 1*).

Additionally, what this clearly shows is that higher price levels for zinc have not resulted in a lowering of zinc reserves, to the contrary. In 2002, the recent price trough for zinc, reserves were 200 000 000 mt (*USGS, Mineral Commodity Summaries, Jan. 2003*). From then until 2005, despite increased prices and increased consumption, reserves grew, as indicated above.

Improved recycling has also helped reduce demand for ore, and will continue to grow

Zinc in the form of scrap and other secondary materials constitutes an aboveground mine, reducing the demand for natural ore to produce refined zinc. In 1996, 509 000 mt of refined zinc were produced from secondary materials; in 2006 that number had grown to 551 000 mt. (*ILZSG, Lead and Zinc Statistics, Table 40, Jan. 1998, Dec. 2007*). And, as more zinc comes into the recycling stream because of increased consumption, this number will continue to grow.

Summary

Zinc reserves have increased dramatically in recent years despite increased mining and consumption of zinc, and, until, recently, despite low zinc prices shrinking exploration and development budgets. Some healthy years to restore those budgets plus increased recycling of zinc-containing materials will continue to ensure that the world has plenty of zinc for many, many years to come.

1 *The International Lead Zinc Study Group (ILZSG) is a non-ferrous metals intergovernmental organisation created by the United Nations in 1959 with 29 member countries accounting for about 90% of total worldwide lead and zinc tonnage. The Study Group's main responsibility is to maintain transparency of production, usage and foreign trades for concentrates and refined metals through statistics, studies and wide-ranging consultation.*

2 *'Reserves' are defined by the USGS as, "That part of the reserve base which could be economically extracted or produced at the time of determination. Reserves include only recoverable materials; thus, terms such as 'extractable reserves' and 'recoverable reserves' are redundant and are not a part of this classification system." The USGS also says, "The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic reserves).*

3 *Moreover, the world reserve base had increased from 330 000 000 mt to 460 000 000 mt.*

The Association wishes to thank Rob White of IZASA for this contribution.

Zinc – Outlook for 2008 and 2009

Usage

- It is expected that global usage of refined zinc metal will increase by 3.8% to 11.78 million tonnes in 2008 and by 3.3% to 12.18 million tonnes in 2009.
- In 2008, Chinese demand is forecast to rise by 13.2%, slightly less than in 2007. However, in 2009, a more significant slowdown in the rate of increase in usage to 7.6% is expected. Elsewhere in Asia further growth is anticipated in India. However, usage in the Republic of Korea is forecast to fall.
- In Europe and the United States declines of 2.2% and 3% respectively are expected this year with usage in both regions remaining flat in 2009.

Supply

- It is anticipated that global zinc mine production will increase by 3.9% to 11.57 million tonnes in 2008 and by 5.2% to 12.2 million tonnes in 2009.
- The recent trend of expansion in Latin America is expected to continue mainly as a consequence of rises in Bolivia, Mexico and Peru. In Europe, increased output at the Aljustrel operation will benefit production in Portugal with rises also anticipated in Finland and Spain, primarily as a consequence of the opening of the Talvivaara and Aguas Tenidas mines.
- In Canada, the opening of Xstrata's Perseverance mine will contribute to an increase in production. Rises are also forecast in a number of other countries including China, India, Iran, and Kazakhstan.
- It is predicted that global refined zinc metal production will increase by 5.1% to 11.93 million tonnes in 2008 and by 4.8% to 12.5 million tonnes in 2009.
- At 640 000 tonnes, output in India this year will be more than double that achieved in 2005, and is expected to increase further in 2009 by which time the country will have become the world's fourth largest producer of zinc metal. A significant amount of new capacity continues to be opened in China and production in the country is forecast to continue to rise.

  Increases are also predicted in Iran, Japan, the Republic of Korea and Peru, where a 160 000 tonnes expansion of Votorantim's Cajamarquilla refinery is due to be completed in the first half of 2009.

World refined zinc metal balance

- The forecasts supplied by the Member Countries of the Group suggest that there will be global surpluses of refined zinc metal of 150 000 tonnes in 2008 and 330 000 tonnes in 2009 as growth in supply continues to exceed that in demand.

The Association would like to acknowledge the advertisers and thank them for their support

General hot dip galvanizing vinyl sticker

Following a number of instances where contractors are supplying continuously hot dip galvanized (PG) components in favour of general hot dip galvanizing because of varying reasons, we will be introducing an identity sticker. This sticker will be applied to general hot dip galvanized components by galvanizers from early 2009, where necessary to identify general hot dip galvanizing.

Walter's Corner

Some experiences from the past

Three essential requirements for success by individuals in an industry are education, training and experience. It is for this reason that for young, up and coming artisans the concept of serving an apprenticeship has been so successful throughout modern industry.

The hot dip galvanizing process is no exception to this requirement and when one considers the importance of quality control, cost control and not least of all, safety aspects, to neglect any of these factors can only mean failure and disaster.

For many years, the Hot Dip Galvanizers Association has been conscious of this with the result that programmes have been developed to provide specialised training for personnel at all levels in its member companies. The need to consider the safety and well-being of personnel is emphasised in an industry such as hot dip galvanizing where individuals are exposed to dangerous chemicals, molten zinc metal and the frequent handling of heavy loads and bulky structures. While training is and always will remain extremely important, there is nothing like firsthand experience to drive home vital lessons. To make a mistake in ignorance is not necessarily a fault but to repeat the same mistake is inexcusable.

I am reminded of an incident which took place many years ago when, as a young man in my mid-twenties, I was instructed to take over management of a general galvanizing plant where previous management had proved unsuccessful. It was not long before I realised that as with most processes, I had much to learn, both technically and management wise.

On this occasion, I entered the production section of the plant at 7am when the day-shift was about to commence. A heat exchanger coil consisting of 50mm diameter steel tubing was mounted on a frame

continued on page 38...

ready to be immersed in the molten zinc at a temperature of 450°c. The coil was required to be galvanized on external surface only, thus the outlets at the header end of the unit had been sealed with steel plugs in order to prevent zinc from entering the coil. On entering the plant, I asked the production foreman if it was safe to immerse a sealed object into molten zinc in this way. His response was that they had done this on numerous occasions in the past without a problem.

As the unit entered the molten zinc there was a sudden loud hissing sound which rapidly increased in intensity as the foreman and his entire team fled out of the plant area, with yours sincerely in hot pursuit. As I reached the exit, there was a violent explosion as the heat exchanger disintegrated in the molten zinc. The header portion was blown off the unit through the asbestos building roof and ended up in a neighbours premises some two hundred metres away while an estimated ten tons of molten zinc had been sprayed out of the galvanizing bath in all directions.

The reason for this disaster was that the heat exchanger had been pressure tested with water after fabrication and the water had not been entirely drained out after testing. On entering the molten zinc at 450°c, moisture trapped within the coil was converted into superheated steam, thus generating enormous pressure.

The solution to this problem is never to immerse a sealed object into molten metal without taking the necessary safety precautions. In this case a snorkel would have avoided the explosion. Having learned our lesson through this experience, a factory rule was introduced which required that sealed structures without provision of a ventilation snorkel were never to be galvanized regardless of the presence of an internal liquid.

In this particular case, we were extremely fortunate in that no one was injured and damage to the plant was slight, whereas in another case, a similar incident could well have resulted in serious injury and extensive investigations by Government Factory Inspectors.

A somewhat amusing sequel to this incident was the arrival at the galvanizing plant of my immediate boss from the head office while we were still in the process of cleaning up the mess. Unaware of the facts, he complimented me and the team for our housekeeping-consciousness and the fact that we were undertaking such a thorough clean up in the plant area. When he was made aware of the true facts, his attitude of course was different!

Some months after this incident, we were called upon to hot dip galvanize a transformer coil which was showing signs of external corrosion. As the coil was lowered into the molten zinc, there was a sudden spurt of transformer oil out of the snorkel despite the fact that we had been assured that all oil had been thoroughly drained out prior to receipt by us. Oil which was deposited onto the molten zinc surface reached flash point and it was not long before the entire area was ablaze with burning oil. Fortunately the coil was removed from the bath by remote hoist control and the flames extinguished some 15 minutes prior to the belated arrival of the local fire brigade.

A moral behind these two incidents is that in critical situations it is important to check the facts in order to ensure that what has been stated as a true fact is indeed correct and not just here-say.

These incidents occurred some fifty years ago when the galvanizing industry was still in its infancy in South Africa. Of course today the industry has reached a mature stage and South African general galvanizers rank among the best worldwide when it comes to diversity of work processed, coating quality, safety factors and efficient performance.

AWARDS EVENT ERRATUM

Following several entries from a major lighting pole manufacturer in our annual awards event and due to project similarity, it was decided in conjunction with the entrant, to combine the projects into a single entry, called "Duplex Lighting Masts". This led to the publication of some errors in the project teams in the previous magazine. We apologise for any inconvenience caused and trust that we have now captured and printed the correct information below.

Rand Show Road (Nasrec):

Client:	Johannesburg Development Agency (JDA)
Architects:	Boogertman Urban Edge & Partners / Mohammad Mayet Architects
Consulting Engineers:	Goba Consulting Engineers & Project Managers
Project Managers:	PD Naidoo & Assoc.
Streetlight Pole Manufacturers:	Industrial Poles & Masts (IPM)
Luminaire Manufacturer and Installers:	Beka.
Galvanizer:	Robor Galvanizers.

Greater Ellis Park Development Project:

Client:	Johannesburg Development Agency (JDA)
Architects:	ASM Architects
Consulting Engineers:	SSI
Project Managers:	Archway Projects / Jaco Meyer of IPM.
Manufacturers:	Industrial Poles & Masts (IPM)
Galvanizers:	Robor Galvanizers

RaiseTech W50 mining drilling machine

The Application

In the early years of mining, rock drilling, in all its forms, was a tedious manual labour intensive operation. From these beginnings, the industry has moved more and more to the implementation of mechanical equipment aimed at the elimination of the human based process. Over the years, various forms of rock drilling machinery have been employed throughout the mining industry. Years of experience and usage of such equipment has highlighted both the advantages as well as the short comings of such equipment.

This case study traces the results of a new innovative prototype rock drilling machine that was hot dip galvanized in order to improve its service life performance within the harsh and corrosive mining environment. The use of hot dip galvanizing for corrosion control of close tolerance machine components (rock drilling machine) is a relatively new and innovative development. The results achieved during the initial trials are very encouraging and performance indicators are well within the original parameter set during the project development. Current expectations are that new development will generate greater efficiencies, longer maintenance free shifts and corresponding economic benefits.

Environmental conditions

Environmental conditions in an underground mining environment can vary from sever to extremely corrosive. Conditions include hot humid atmospheres, cooling water contamination as well as being subjected to mechanical damage resulting from physical handling and actual working conditions at the working face. Experience has shown

The hot dip galvanized prototype rock drilling machine as supplied.

that the service life of mechanical mining equipment requires more regular maintenance that that encountered in most other harsh environments.

The use of hot dip galvanizing was motivated by the fact that painted equipment requires more regular maintenance, which in turn is expensive and a corresponding short working cycles within the harsh mining environment. Paint simply does not provide an extended service life within most mining conditions. Past experience has shown that a service life will range from a few weeks to 2 or 3 months maximum. Subsequent maintenance and refurbishment of equipment is far more difficult and costly as well as being disruptive to mining operations.

Refurbishment of painted equipment requires shot blast cleaning and a full repaint operation in order to

The machine in operation.

Hot Dip Galvanizers Association Southern Africa
Unit U4 (Upper Level), Quality House, St. Christopher Road, St. Andrews, Bedfordview
P.O. Box 2212, Edenvale, 1610 • Website: www.hdgasa.org.za • E-Mail: hdgasa@icon.co.za

achieve an acceptable and presentable product to the client. This requirement does not arise in the case of a hot dip galvanized machine. The intervals between maintenance periods are also extended and maintenance requirements are greatly simplified.

The site

Two platinum mines were selected for testing the hot dip galvanized drilling machine. The machine spent three months at the first location followed by a further month at the second mine. After a period of four months in actual working conditions, the machine was recovered for maintenance at which time the effects of corrosion damage was examined.

Our findings

The hot dip galvanized steel components were standing up to the condition extremely well with no discernable deterioration. Comparisons to painted and uncoated components on the machine, clearly demonstrated the differences in corrosion control performance. Early performance indications were very encouraging and that potential economic benefits could be significant.

Conclusion

benefits for all structural steel components. These benefits reduce maintenance costs; extend the working life of equipment, which in turn has direct economical benefits for the mine owner.

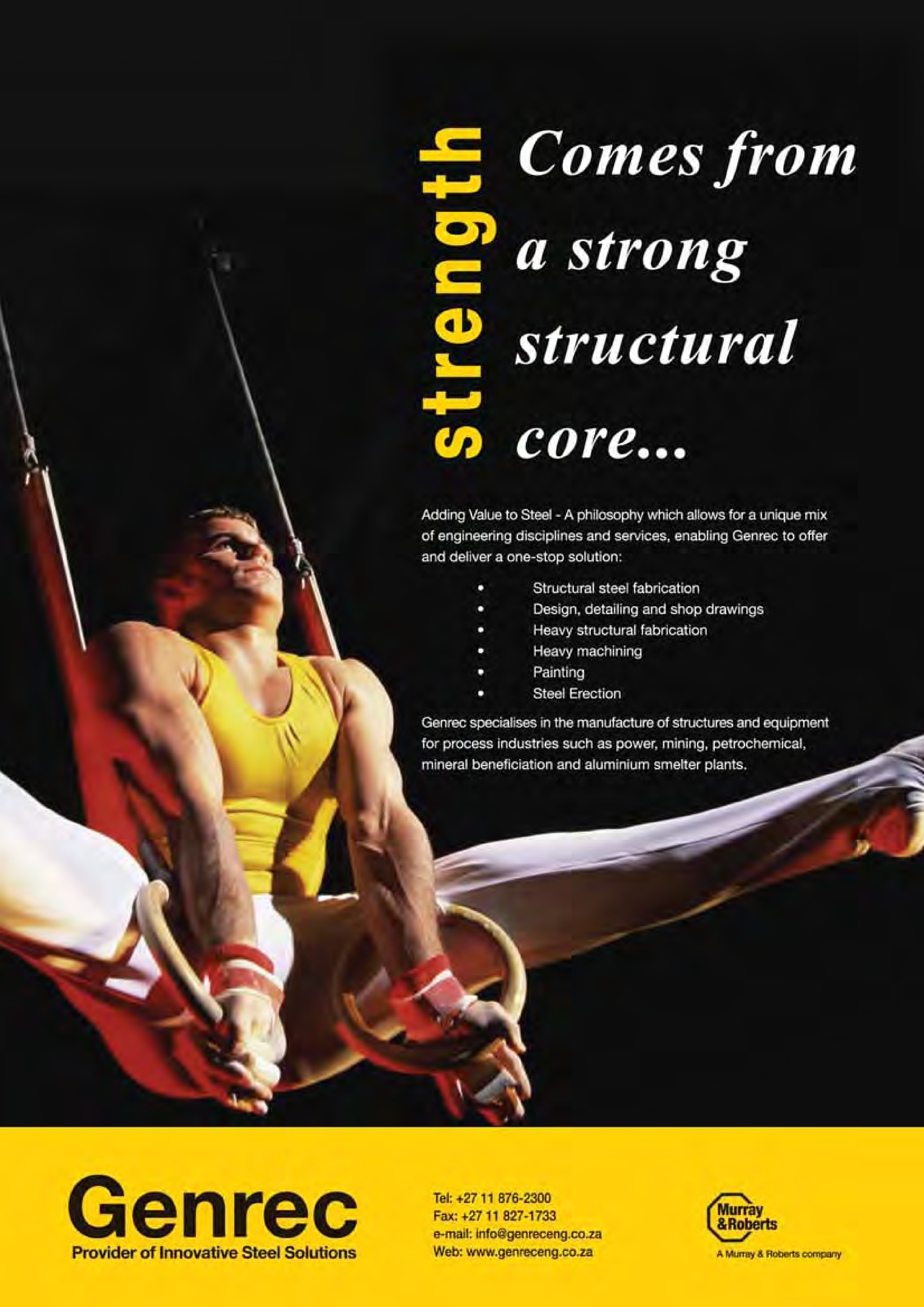
Hot dip galvanizing of close tolerance machine components represents a significant departure from the past. The application of hot dip galvanizing steel should be seriously considered whenever environmental conditions are known to be highly corrosive.

Mobility of the equipment, to the mine site as well as underground, was an important feature and therefore incorporated into the design.


Photograph taken of the drilling machine after 4 months operational conditions, illustrating the comparisons between uncoated bolts, painted surfaces and the hot dip galvanized machine components.


Where hot dip galvanized fasteners were used the comparison to uncoated fasteners is clearly evident.


Steel components, added after hot dip galvanizing, were silver painted, again illustrating the corrosive effect relative to the hot dip galvanized surfaces.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AKZO NOBEL