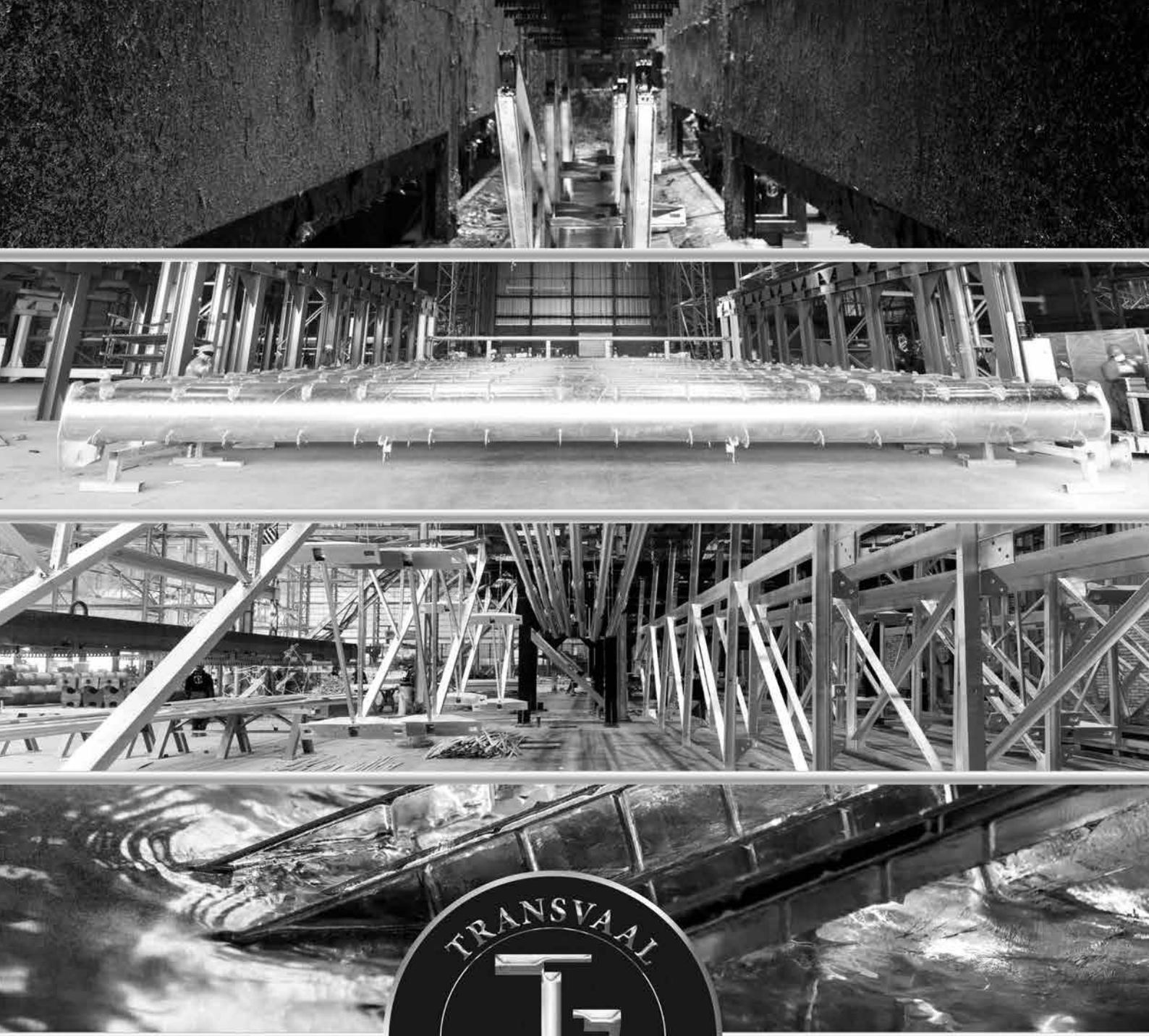
Volume 19 Issue1
April / May 2022

HOT DIP GALVANIZING TODAY 79

The Official Publication of the Hot Dip Galvanizers Association Southern Africa

CORROSION CONTROL OF STEEL



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ISSN 1023/781X

PUBLISHED BY:
Hot Dip Galvanizers Association Southern Africa
Bedfordview Office Park, Building 1, Ground Floor, 3 Riley Road, Germiston
P.O. Box 2212 Edenvale 1610 Tel: 011 456 7960 Email: hdgasa@icon.co.za Website: www.hdgasa.org.za

Executive Director: Robin Clarke Cell: 082 902 5119 Email: robin@hdgasa.org.za

Publication Liaison: Anthony Botha Cell: 082 326 6080 Email: anthony@hdgasa.org.za

Design and Layout: Sandra Addinall Tel: 011 868 3408 Email: cbtdesign@adcot.co.za

Reproduction and Printing: Camera Press Tel: 011 334 3815 Email: cpquotes@camerapress.co.za

EXECUTIVE DIRECTOR'S Comment

Like many businesses linked to construction and manufacturing, the hot dip galvanizing industry has in all probability not faced as many challenges over the past twenty-four months as it has in the past.

Despite this the industry remains resilient and opportunities for investment and modernization remain under consideration.

Mid-2021 marked a distinct upturn in hot dip galvanizing activity. This we believe was driven mainly by infrastructure projects being triggered as well as a private enterprise "catch -up" after the dormancy during the Covid lockdowns. Activity levels, albeit with regional variations, remain high. Two micro indicators in support of this have been the news from our reciprocal members, the S.A. Institute of Steel Construction that has received over 70 project nominations for their annual awards. Closer to home, the Hot Dip Galvanizing Association has been engaged in extensive training of both plant operators and quality assurance inspectors to ensure industry compliance for the manufacture and hot dip galvanizing of steel to the highest standards. The high numbers trained, and this investment both across the country as well as our SADC neighbours, certainly bodes well for the industry.

The last quarter of 2021 did however bring an unusual macro-economic event that has required very careful management of stock holdings of Zinc.

Land-locked zinc smelters in Europe have suffered high escalations in energy prices and particularly so during "winter tariff" periods. It is estimated that 250kt of capacity was pulled offline. At such times commodity traders indulge in scenario modelling for stock levels vs production vs consumption. The variables and assumptions used in these calculations are manifold and complex. It is estimated that stock cover in Europe will remain at safe levels, but LME prices have risen sharply, and profitable arbitrage opportunities has led to regional movements of stock in Europe. African markets have been less well positioned since lower volumes are called off and trading premiums which include the cost of freight are significantly higher than European trades.

Whilst analyst predict that the European summer will see the return of stability, timeous ordering of Zinc against accurate consumption forecasts will be needed for Southern African consumers. The accuracy of consumption forecasts will be dependent on strong relationships with customers who are able and willing to share their requirements, both fixed and for potential projects.

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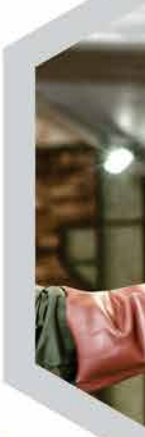
EDITORIAL COMMENT
in this issue

The COVID pandemic is waning, economies are eager for the expansion of fabrication and manufacturing to ramp up. Galvanizing is by all means awaiting the opportunities of a global economy that is being revived. However, the Ukraine / Russia conflict now threatens energy supply and drives the price of metals higher every day. Never before has the idea of being prepared been so clear. *"All things are ready, if our minds be so." – William Shakespeare.* The training and preparation today with challenges renewed means we remain ready for success:

- Training, preparation – one and the same, getting the mind ready means we are ready. The HDGASA training programme is driving preparedness in conjunction with the business owners and their associates who await return to a rise in fabrication and manufacturing when it arises
- The galvanizers bath is where the coating is born. Apart from 98.5% pure zinc what proportions of other metals may it contain?
- The INTERGALVA event is in Rome in 2022, we look at the upcoming event and encourage all to consider the benefits from attending this highly acknowledged meeting of global galvanizing
- Menace from the mill, Mill Scale – How we can deal with the condition and how we can ensure it is addressed to ensure quality galvanizing.
- Food is central to life, zinc too, we look at the application of hot dip galvanizing in the food arena from storage to preservation.
- Welding hot dip galvanized material provides clear and accurate information on this little understood skill. Yes, it can be done and No, it is not very difficult or hazardous.

I hope you enjoy this edition and stay well prepared for taking every opportunity in both hands.



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HOT DIP GALVANIZING SOLUTIONS
in the food and beverage industry

WITH A DAILY GRIND RIDDLED WITH FORKLIFTS, PALLETS, CHEMICALS, WASH-DOWNS, AND MOISTURE, FOOD AND BEVERAGE PROCESSING FACILITIES ARE SOME OF THE TOUGHEST, MOST CORROSIVE ENVIRONMENTS IMAGINABLE.

The food processing industry is very cost competitive. Any opportunity to decrease operating costs can lead to an advantage in the market place and higher profit margins. Hot dip galvanized steel's maintenance-free service life translates to significant savings in both food and beverage industries.

The global industry watchdog, the USA Food and Drug Administration (FDA) has approved the use of hot dip galvanized steel for food preparation and conveyance for all applications. However, foods that have a high acid content, such as tomatoes, oranges, limes, and other fruits are not suitable for storage due to the high rate of depletion of the zinc in acidic environments.

The hot dip galvanized coating protects iron from interacting with food products while also protecting the steel from corrosion from the environment. This double protection as both a barrier and through cathodic protection lasts for many years and needs little to no maintenance. Some of the applications for galvanized steel are food storage racks, bar counter tops, coolers and meat storage hooks, as well as many products at the site of food production. At the farm you can find many galvanized products such as dairy stalls, milk cans, chicken coops and many others. The following is a list of common applications where hot dip galvanizing is used in food and beverage facilities:

- Equipment Hooks
- Feeding Equipment
- Grain Elevators
- Grain Hoppers
- Growing Racks
- Refrigeration Shelves
- Silo Extraction Equipment
- Slotted Floors
- Stanchions
- Storage Racks
- Trailers
- Veterinary Equipment
- Watering Troughs
- Farm Buildings
- Waste Handling
- Substation Structures

Aesthetics

Food processing facilities are becoming more welcoming to the public and need to provide a clean, durable and positive image. Hot dip galvanizing provides this aesthetic appeal while allowing the facility to be corrosion-free and aesthetically pleasing to visiting members of the public.

Durability

Whether rough, physical abrasion or slow, insidious deterioration over the years of exposure to moisture and chemicals, hot dip galvanized steel provides the most

comprehensive protection against corrosion inside and out.

The hot dip galvanized zinc / zinc-iron coating developed during the galvanizing process creates a barrier which protects the steel against the corroding effects of moisture and chemical abrasion.

With rigid regulations for cleanliness, food processing plants are exposed to more than the average share of harsh chemical cleaners and water. Moisture is everywhere in a food processing facility and having a corrosion protection system that will protect against this harsh environment is crucial.

Hot dip galvanized steel has stood strong against the harshest moisture environments imaginable and has proven over the decades to protect pipes, storage racks, and other structures from moisture and condensation especially inside large cold storage areas.

Here the temperature of the air may have a substantial impact on the corrosion rate of some unprotected materials. Galvanized steel protects against corrosion at very low temperatures (below -40°C) to high temperatures (≥70°C to ≤200°C).

This wide range of operating temperatures makes hot dip galvanized steel a good choice for food processing facilities whether the facilities are frigid or heated.

Figure 1 below shows the durability factors of hot dip galvanized coatings in five different environments. From these the expected service life of the coating 'to-first-maintenance' can be determined.

According to *SANS 121:2011 (ISO1461:2009) Table 3*, a minimum coating of 70µm is required for steel of 6mm thick, meaning even in the harshest Industrial food processing and storage environments, where the rate of corrosion of the hot dip galvanized coating is ≤1µm per year can provide a maintenance free period of up to 70 years.

Safety

Food processing is one of the largest manufacturing industries in South Africa as it is in the USA. Keeping corrosion at bay is critical since it can lead to unacceptable contaminates in a food manufacturing environment that threated sanitation and

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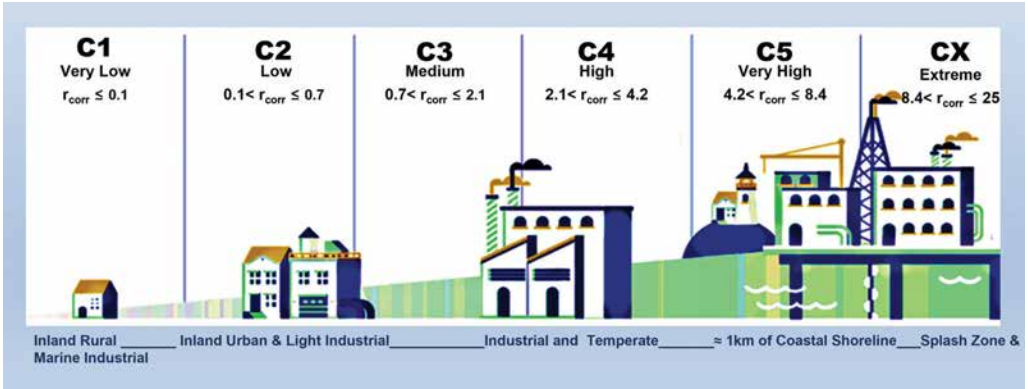

Figure 1: Environment guidelines and rates of zinc corrosion based on ISO9223 and ISO12944.

product safety, as well as reduce the reliability of machinery, leading to costly downtime. Corrosion is a threat to the overall success and profitability of any food manufacturing facility. Hot dip galvanized steel offers a safe, reliable, durable coating to protect structures within a facility, while the natural zinc poses no threat to the products transported through the facility as zinc is a micronutrient needed by animals and humans alike to maintain their health.

Maintenance free service life

Food manufacturing facilities are highly corrosive environments due to the continual exposure to chemicals, water and other corrosive elements used during processing and daily sanitation. It is critical to prevent corrosion in order to avoid the high costs of repair, replacement, and downtime that is often the result of corrosion damage. By taking preventative measures; by designing the facility to utilize hot dip galvanized steel this will reduce the threat of costly corrosion related expenditure. Facility owners do not have time or money to waste on these types of downtimes, and with the use of hot dip galvanized steel there will be nothing slowing down the flow of product through the facility.

Hot dip galvanizing is a coating of naturally occurring zinc metallurgically bonded to steel to protect it from environmental corrosion for years with little to no maintenance. The zinc coating of hot dip galvanized steel corrodes at a very slow rate, protecting food and beverage plants with an aesthetically pleasing, consistent appearance, and is 100% recyclable at the end of life.

Sustainability

Sustainable development is the social, economic, and environmental commitment to growth and development that meets the needs of the present without compromising the ability of future generations to meeting their own needs. The food and beverage sector faces an enormous amount of pressure to be sustainability conscious. Specifying hot dip galvanizing allows the industry to use facilities that are corrosion and maintenance-free while using 100% recyclable steel and zinc. Hot dip galvanized projects add huge benefits to a company's sustainability programs and help to lead the way in this new green industry.

Life-cycle cost

Motivated by increasing demands of food and beverage projects to be environmentally sound, life-cycle cost is extremely important to protect and prepare projects for little to no maintenance for years to come.

Food and beverage projects are often in service for many years before they are changed out. It is not only important to consider the initial capital cost, but also what the cost will be over the life of the project. Galvanized steel is durable and maintenance-free, ensuring that the only corrosion system cost incurred at the initial construction phase.

While the initial cost of hot dip galvanizing compares favourably with inorganic paint systems over time, hot dip galvanizing will deliver substantial savings, through deferred maintenance costs, repairs, and touch-ups. It is therefore responsible and reasonable to determine the life-cycle cost at the outset, even prior to the design phase.

Source: Based on AGA article 'Hot Dip Galvanized Food & Beverage Products'.

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OPTIMAL ZINC BATH chemistry

Currently, the most rational method of managing the chemical composition of the zinc bath is the appropriate selection of the configuration of the bath additives and constant maintenance of their content in the bath within a narrow range of concentration changes that allow for their most effective interaction. The optimal chemical composition of the bath should contain alloying additives that will ensure the reduction in the amount of zinc ash, limiting the reactivity of the steel in the bath and improving the drainage of liquid zinc from the product surface. All these requirements are met by the group of five metals: Al, Ni, Pb, Bi and Sn, which are currently used as alloying additives to the zinc bath. The qualitative composition of the bath is selected individually and depends mainly on the range of products galvanized in a given galvanizing plant. Al and Ni are now permanent alloying additives to the zinc bath. On the other hand, Pb, Bi and Sn are used interchangeably, and their presence in the bath is determined by such criteria as the impact on the environment (Pb) and the risk of LME (Bi, Sn). Therefore, the optimal chemical composition of the bath in different galvanizing plants may be different. However, to ensure high coating quality and process efficiency, it is important to follow good bath management practices and to constantly control the content of the alloying additives in the bath. The optimal content of alloying additives in the bath should be:

- for Al 0.005–0.01 wt %,
- for Ni 0.04–0.06 wt %,
- for Pb 0.4–0.5 wt %,
- for Bi 0.05–0.1 wt %,
- for Sn 0.1–0.3 wt %.

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Note on Aluminium

Aluminium is a very common bath additive and is typically added to the kettle at concentrations between 0.005% and 0.01% to:

- Increase brightness of the galvanized coating
- Reduce zinc ash formation
- Improve zinc flow/drainage
- Reduce spangle size
- Control coating overgrowth on high-silicon steels

However, it is important to note the aluminium content of the zinc melt for the wet galvanizing process must not exceed 0.002%. This is because aluminium can react with the zinc-ammonium chloride flux used in wet galvanizing. Higher concentrations of aluminium than the maximum recommended value can cause defects such as bare/black spots in the galvanized coatings. For the dry process, this maximum value is higher (0.007%) since the reaction between the aluminium and the top flux (forming aluminium chloride) is not an issue.

For adjusting the aluminium content in the zinc-bath to acquire these benefits, the aluminium must be evenly distributed until the desired concentration is reached.

Because pure aluminium is less dense than zinc and has a melting temperature (660°C) higher than a typical zinc bath, wasted aluminium will float to the top of the zinc melt and there will likely be issues distributing the aluminium consistently within the bath. In order to avoid sections of the zinc melt containing a higher aluminium concentration than desired, pure aluminium should be carefully distributed and well mixed within the bath as it dissolves.

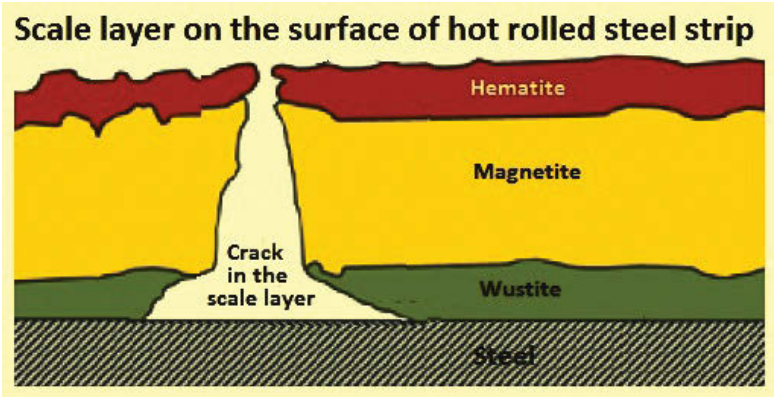
It is not recommended to use scrap aluminium due to the additional concern of undesired and uncontrolled amounts of impurities such as iron, copper, chrome, manganese, and magnesium found in common aluminium alloys.

In order to best distribute aluminium and avoid bare spots, it is recommended to add aluminium to the zinc bath in the form of Zn/Al alloy bars (brightener bars) because the lower melting points of Zn/Al alloys more closely coincide with the zinc bath temperature. Zn/Al brightener bars should not be floated on top, but instead plunged beneath the surface of the bath to the bottom and mixed well to promote even distribution as the aluminium rises. ASTM B860 lists the recommended varieties of brightener bars (4, 5 or 10% Al content) and also the maximum allowable impurity contents

MENACE from the mill

Mill scale is the product of oxidation which takes place during hot rolling. The oxidation and scale formation of steel is an unavoidable phenomenon during the process of hot rolling which involve reheating of steel in a reheating furnace, multi-pass hot rolling and air-cooling in the inter-pass delay times and after rolling. Mill scale is usually removed by process water used for descaling, roll and material cooling, and by other methods. It is subsequently separated by gravity separation techniques.

The formation of oxide scale not only results in a significant loss of yield of steel, but also deteriorates the surface quality of the steel product caused by rolled-in scale defects or roughened surface. In addition, the presence of a hard scale layer on the steel can have an adverse effect on roll wear and working life. The amount of mill scale generated in a rolling mill depends on the type of the reheating furnace and on the practice of rolling adopted in the mill. It is generally in the range of 1% to 3% of the weight of the steel rolled.



Mill scale mill scale is a layered and brittle material, composed of iron oxides with *Wustite* as a predominant phase. It is normally considered as waste material. Scale formed during the heating of steel to rolling temperatures in the reheating furnace is known as primary scale. This primary scale is removed generally by hydraulic descaling before hot rolling. The removal of the primary scale formed during the reheating operation before hot rolling is usually done for producing steel products with high surface quality and for reducing roll wear. However, secondary scale continues to form on the descaled steel surface during the inter-pass delay time in the roughing and intermediate rolling mills. The colour of primary mill scale is generally bluish black while that of the secondary scale is blue. The secondary

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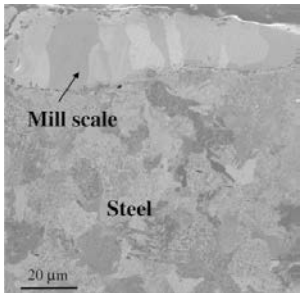

Figure 1: Components and micrograph of mill scale.

scale gives the steel an appearance which is similar to that of a lacquer coating finish.

The iron in the primary mill scale is usually present in different chemical forms. The primary scale has three layers of iron oxides consisting of *wustite* (mostly FeO), magnetite (Fe_3O_4), and hematite (Fe_2O_3) from the metal surface outwards.

Wustite is the inner most phase of the scale which forms next to the metal and is the Fe rich phase. It has the lowest O_2. It is represented as FeO.

The Magnetite phase, Fe_3O_4 is the intermediate phase of the scale. It is the main equilibrium constituent of scale below 500°C. It exists as a metal deficient oxide but at a much smaller level than *Wustite*. It has been shown from various studies that both cations and anions diffuse in Fe_3O_4, Magnetite occupies only around 4% of the total scale layer. Magnetite is harder and more abrasive than *Wustite*.

The Hematite phase, Fe_2O_3 is the outer most layer of the scale and has the highest oxygen content. Hematite occupies around 1% of the total scale layer at high temperatures. As with the Magnetite phase, Hematite is hard and abrasive.

The secondary mill scale is composed of iron oxides which predominantly consist of ferric oxide (Fe_2O_3). The thickness of this oxide layer is normally less than 0.1mm. It initially adheres to the steel surface and protects it from atmospheric corrosion provided no break occurs in this layer. Since secondary scale layer is electro-chemically cathodic to steel, any break in this scale layer causes accelerated corrosion of steel exposed at the break. The secondary scale layer is thus a boon for a while since it protects the steel against corrosion. However this protection disappears when the coating breaks due to handling of the steel product or due to any other mechanical cause. The size of Mill scale normally varies from dust size in microns up to usually 6mm.

Mill scale is a nuisance when the steel is to be processed. Any coating applied over it is wasted, since it comes off with the scale as moisture laden air gets under it. All mill scale needs to be removed to present a uniform and clean surface of the substrate steel for any application of any coating on the steel.

Removal of mill scale is virtually impossible by hand. It is extremely tedious and time consuming using power tool cleaning methods. Neither of these two methods gives a good base to start. Steel from the hot rolling mills has no surface profile, which is most important to the overall adhesion strength and integrity of the coating system. Mill scale is normally removed from steel surface by flame cleaning, pickling or abrasive blasting. These methods remove the mill scale and provide a surface profile that gives the coating system its design requirements. Coating over mill scale, however tempting, is a futile exercise, as the presence of mill scale on the steel surface accelerates the corrosion of the underlying steel.

WELDING galvanized steel

It is preferable to weld fabrications prior to hot dip galvanizing. Fabricators need to be aware that for structures to be hot dip galvanized electrode choice takes into account the need to have a low residual silicon level in the weld. It is sometimes necessary to weld after galvanizing. The welding of galvanized steel requires some changes to the methods employed when welding uncoated mild steel.

Fume

When welding galvanized steel white fumes of zinc oxide are produced. Inhalation of these fumes may cause physiological problems which, although short term, are easily avoided. Adequate ventilation combined with proper fume extraction completely eliminate exposure to welding fumes.

Spatter

Vapour streaming from the zinc coating causes excessive spatter to be produced when welding galvanized steel. However, this is easily removed by use of an anti-spatter agent when welding.

Weld gap and speeds

When welding galvanized steels, it is necessary to volatilize the molten zinc from the weld pool. As a consequence, for a given electrode, penetration rates and welding speeds are lower than with uncoated steel. In order to compensate for this, root gaps should be increased by 50% and a reduction in speed of 25% is typical as a back and forward movement is require in order to volatilize the zinc in front of the weld pool.

Weld cracking

Fillet welds made by MIG/MAG (Metal inert gas/metal active gas) welding on 6mm and thicker galvanized steel and by MMA (Manual metal arc, shielded metal arc or stick) welding steel thicker than 10mm sometimes contains cracks through the weld throat. These are caused by the penetration of liquid zinc from closely abutting surfaces at the weld root.

This can be prevented by:

- providing an edge preparation such as a single or double bevel.
- removal of zinc from both adjoining surfaces by burning or grit blasting, on the application of a mask prior to hot dip galvanizing

- providing a 1.5mm gap between the plates.

Arc length

A shorter arc length is needed when welding galvanized steel in order to avoid excessive penetration or undercut.

Welding current

With rutile (high titanium dioxide) or basic coated (high calcium) electrodes the welding current used for uncoated steel is also suitable for galvanized steels.

Choice of electrode

A choice of welding electrodes can be discussed with the South African Institute of Welding.

To make sure that the operator is safe while welding, it is essential to follow these tips. Below are some safety welding practices.

Safety

Clothing and Personal Protective Equipment (PPE)

Remember that when welding, any exposed skin is susceptible to the damaging effects of UV and infrared rays. Furthermore, sparks can easily catch in open pockets, cuffed pants or shirts that are not completely buttoned. That is why it is important to wear clothes that don't expose the skin. Also, make sure not to keep any matches or butane lighters in your pockets. Using bona fide flameproof PPE will address all these concerns and ensure peace of mind to the welder. Before anything else, every welding personnel should be provided with proper welding personal protective equipment. PPE equipment includes welding gloves, helmets, leather jackets and boots. Apart from these a respirator is required when welding galvanized steel. For best foot protection, use high-top leather shoes or boots. Make sure that the pants should go over your shoes.

Working in a well-ventilated area is crucial

Make sure that there is enough clean breathing air. Smoke and fumes emitted during welding have the potential to create a breathing hazard. Hazardous fumes can accumulate easily. shielding gasses may also displace oxygen rich breathable air.

If the welder is working in confined spaces, use an exhaust hood. This can remove fumes from the space and ensure that there is enough clean air to breathe.

Eye protection

Always wear proper welding helmets with filter shade. This is to protect the welder's eyes when welding. Choose an approved safety glasses with side shields and ear protection.

Welding with unprotected eyes is not acceptable, a welder may experience arc flash with just a few seconds of exposure to welding arc's rays. This painful condition in the eyes may last several hours after exposure and may even cause long term damage from extended exposure.

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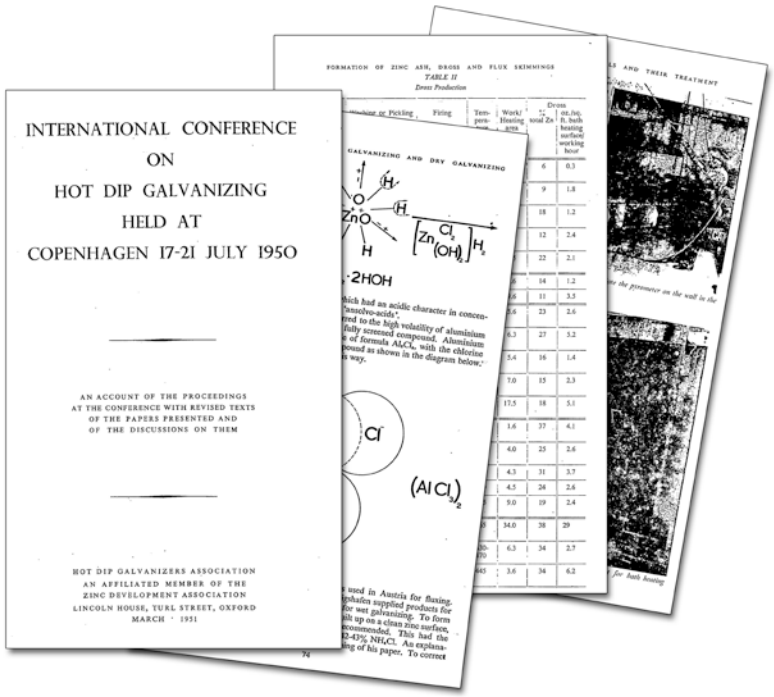


Intergalva 2022 is organised by European General Galvanizers Association (EGGA) and hosted by Associazione Italiana Zincatura (AIZ). The Intergalva series began in 1950 and was last held in Berlin in 2018.

Origins of Intergalva

The first International Conference on Hot Dip Galvanizing was held at the Institution of Danish Civil Engineers in Copenhagen from 17-21 July 1950. That first conference was organised by the British Hot Dip Galvanizers Association, which at that time was affiliated to the Zinc Development Association. The 80 experts that gathered in Copenhagen debated many of the topics that still feature in today's Intergalva conference sessions. Technical sessions included papers and discussions on the role of aluminium additions to the galvanizing bath, influences on dross formation, inhibition of white rust and methods of drossing. The session on 'The Future of General Galvanizing' and discussions on 'Rivals to Galvanizing' make fascinating reading over 70 years on and looking back on how the industry did flourish much as was predicted at the time!

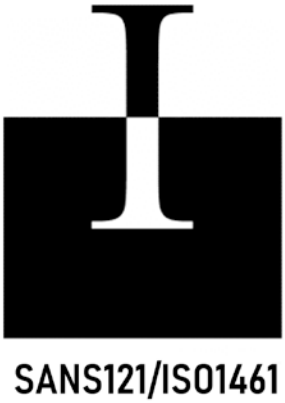
Another notable feature of the first conference was the presence of Dr Heinz Bablik. Generally accepted as the 'father' of the industrialisation galvanizing process, Heinz Bablik combined being a lecturer in the Technical University of Vienna with managing the family galvanizing factory in Brun (a plant that still operates today as part of the Zinkpower Group). This combination of theory and practice resulted in his classic book on galvanizing first published in 1926. By 1950, it was in its third edition and also translated into English. He attended the 1950 event and delivered a keynote speech on 'The Relative Merits of Flux Galvanizing and Dry Galvanizing'. Of course, this is one debate that we will not be holding at today's Intergalva events.

A digital version of the full 160-page Proceedings of the first International Conference on Hot Dip Galvanizing is free to download *(https://intergalva.com/wp-content/uploads/2021/12/International-Conference-on-Hot-Dip-Galvanizing-Copenhagen-July-1950.pdf)* so you can read more of those first discussions and collaborations that gave birth to today's spirit of Intergalva.

By 1955, three international conferences had stimulated demand for a European Galvanizers Federation but the sheet, wire and tube galvanizing industries were largely served through the steel industry and it was left to the general galvanizers to form their own association in November 1955. By ballot, Heinz Bablik was first choice for President and EGGA was born. EGGA took over the organisation of the conferences, which were then held in Milan (1956) and Belgium (1958). That started the pattern of conferences every 3 years with the host country nominating the EGGA President. From then on, the series of International Galvanizing Conferences (also known as Intergalva) has never looked back as the leading international forum for the industry.

Marketing – The new symbol for batch galvanizing

After extensive discussions within the EGGA Marketing Committee, a common symbol for batch galvanizing has been established. These discussions started in response to the age-old problem of other coatings 'pretending' to be a batch galvanized coating. The misuse of the



word 'galvanizing' is hard to stop – so a new, more visual, approach was needed.

Many options were explored – some more innovative than others and we had many arguments along the way! Our final choice was for a simple and effective symbol that reinvents the traditional 'I-Beam' in a modern context.

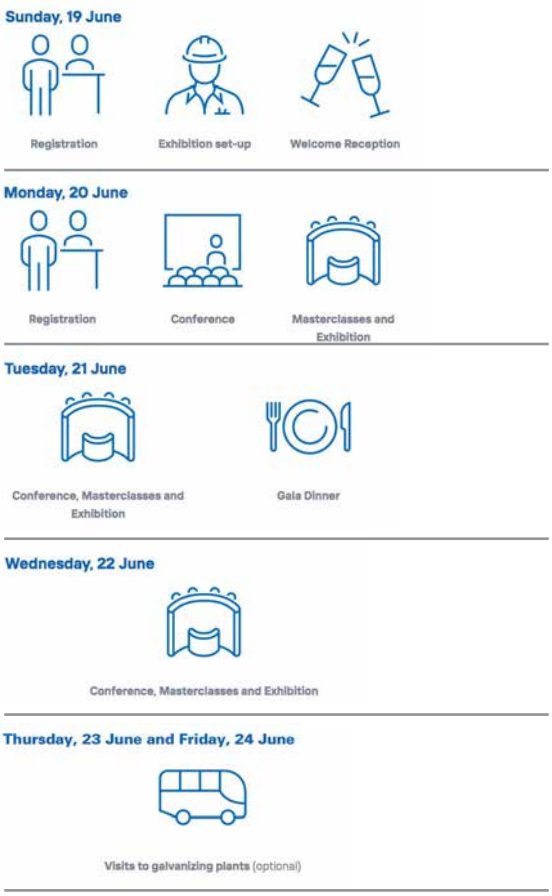
There are two versions of the symbol – with and without the text 'EN ISO 1461'. The version that includes 'EN ISO 1461' is for normal use. The alternative version is for use when the text may be too small or inappropriate to the use of the symbol. In theory and by agreement, other equivalent national standards could be used with the symbol.

A 'Symbol Guidelines' and final graphics package has been issued to EGGA's National Associations and we are ready to share the use of the symbol with our worldwide partner associations.

The symbol is intended to distinguish batch galvanizing from other protective coatings and to provide a common generic identity within our communications. It is not intended as a 'brand' logo. Its origins lie in the past difficulties encountered through the lack of a clear identity and the confusion of technical terms and phrases to describe batch galvanizing.

Initially, it is intended that the symbol will be used by National Associations in technical/promotional literature, websites, etc. Member companies of associations may also use the symbol. Decisions on use by member companies should be taken at national level.

The provisional schedule for Rome Intergalva 2022 is:



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

TRAINING leads the charge

THE HOT DIP GALVANIZERS ASSOCIATION SOUTHERN AFRICA (HDGASA) HAS BEEN AT WORK WITH EXTENSIVE CALLS FOR TRAINING THROUGHOUT SOUTH AND SOUTHERN AFRICA.

The waning of the COVID pandemic and the push to get economies moving has seen strong support for hot dip galvanizing training at all levels. The Introduction to Hot Dip Galvanizing is designed as a workshop to introduce the broader spectrum of workers, support staff as well as newer employees in the industry. The Level II course over three days provides indepth training and skills competency which is required by those people who need to have a solid understanding of hot dip galvanizing and by achieving at least an 80% pass mark in the third examination, opens the doors to the delegate being accepted as a HDGASA Hot Dip Galvanizing Inspector.

The HDGASA also provided content and signed a M.O.U with a local online training organization who are licenced to develop online training of hot dip galvanizing with the course "CORROSION CONTROL & HOT DIP GALVANIZING" throughout Africa outside of South Africa and the SADC region.

Internationally the INTERNATIONAL ZINC ASSOCIATION (IZA) recognized the HDGASA Level II training programme as a premier course in hot dip galvanizing. The IZA have also acquired the licences for the HDGASA Level II programme to be made available through specific entities under their umbrella. Two M.O.U's were signed with the HDGASA, for the South American Region and the Asia Pacific Region.

The HDGASA were contracted to provide information and support for a large Angolan company who recently acquired a hot dip galvanizing plant in Luanda, Angola. On site evaluation, advisory services and fundamental training was provide through the HDGASA. A further ongoing programme of participative training and marketing events is planned for the near future in Angola.

Once again, the importance of training has been understood by the hot dip galvanizing industry. Active members support of maintaining a front of mind understanding of hot dip galvanizing's corrosion control technology with the immediate and long-term benefits being promoted. The support of these organizations is greatly appreciated by the HDGASA.

"Knowledge is the only instrument of production that is not subject to diminishing returns" John Maurice Clark

COURSES OFFERED

Level I: Introduction to Hot Dip Galvanizing

The HDGASA one day INTRODUCTION TO HOT DIP GALVANIZING course is designed to provide an initial understanding of the concepts relating to hot dip galvanized coatings applied for corrosion control of steel components. The course comprises six modules. In order for the course to be viable we require six or more candidates to attend. Arrangements can also be made for this course to be held at a venue of your choosing for more than six candidates. In addition to the course, a special visit to a hot dip galvanizing plant may be arranged on a separate date, should six or more candidates be interested and able to attend.

Level II: Certified Galvanizing Inspectors

The HDGASA advanced Level II course provides the necessary skills to assess the quality and conformance of Hot Dip Galvanized coatings and Duplex Systems to the applicable specification. Delegates are introduced to other metallic type coating specifications and their application for corrosion control design.

The course provides an in-depth interpretation of the specifications and accepted best practice procedures for determining coating thickness, visual inspection of surface finishes as well as the evaluation of these coatings for corrosion control of steel components. The course includes a visit to a hot dip galvanizing plant where delegates will have an opportunity to assess finished product against the relevant quality standards on a real time first hand basis.

Three Continuous Professional Development (CPD) points are awarded to delegates attending the entire course. Bookings are limited to a maximum of 10 people, with applications treated on a first-come-first-serve basis. In order for the course to be viable we require 6 or more candidates to attend. Arrangements can also be made for the course to be held at a venue of your choice for more than 6 candidates.

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INCLUDES ELECTRONIC 'HDGASA INSPECTOR TOOLKIT'

HOT DIP GALVANIZERS ASSOCIATION SOUTHERN AFRICA

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Armco Galvanizers Isando has been operating since 1989. Geared up to accommodate heavy structural steel up and till 13m in length. Isando has an average output of plus minus 2000 tons per month.

Armco Galvanizers Randfontein is our second facility based in the Randfontein area. Randfontein has an average output of plus minus 800 tons per month and is geared up to handle light to medium structural steel up and till 6m in length.

Armco Superlite is listed in accordance with the BSI ISO 9001:2015 quality scheme which ensures the quality of all products and services produced by **Armco Superlite**. Specific customer quality plans are drawn up where required for any of our operations.

Armco holds the SATAS mark for Hot Dipped Galvanized steel and all products galvanized at our premises are according to the SANS 121 / ISO 1461 specification. Galvanizing certificates are supplied on request.

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