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■ Volume No.17
■ Issue No.2 April – June 2025
■ ISSN No. 2054-1813

Editor: Mark Langdon mark@pce-international.com
Contributing Editor: Mike Garside mike@pce-international.com
Advertisement Manager: Nick Carugati nick@pce-international.com
Production Manager: Tatum Le Patourel tatum@satzuma-creative.co.uk
Designer: Fiona Andreanelli fiona.andreanelli@mpigroup.co.uk
Accounts: Claire Long claire.long@mpigroup.co.uk
Publisher: Andrew Deere andrew.deere@mpigroup.co.uk

TAKING AEROSPACE COATINGS TO INFINITY & BEYOND

Meet *AkzoNobel's Michael Suhara*, the man who's light years ahead with painting the future.

Imagine being able to create flying works of art – dazzling designs that can turn the skies into a soaring showcase of aeronautic creativity.

It's a tough job, but somebody has to do it. However, if you ask Michael Suhara to describe his role at AkzoNobel, he'll cryptically tell you he's the Senior Technical Service Coordinator for Aerospace Coatings. That doesn't even tell half the story.

Fast closing in on 30 years with the company, Suhara is AkzoNobel's go-to person for Boeing when it comes to developing new products that meet their strict specifications. That's a huge responsibility in itself, but he also takes care of another area of the business – he oversees the collaborative process behind the eye-popping liveries that are regularly applied to aircraft using the company's high-performance products.

Works of art

This is where Suhara's decades of experience in aerospace coatings take on another dimension. Over the years, Suhara (who is based in Seattle in the US), has honed additional skills as an artist and designer – which comes in quite handy when you're helping customers turn aircraft into flying works of art.

> “The thing about paint is that it’s usually the last thing people think about, but it’s the first thing you see.”

The many and various projects he has worked on include Star Wars and Toy Story-themed liveries for Alaska Airlines, which obviously invites comments that he’s taking customers to infinity and beyond. That’s closer to the truth than you might think, because as far as Suhara is concerned, he’s laser-focused on ensuring that every customer gets exactly the colours they’re looking for.

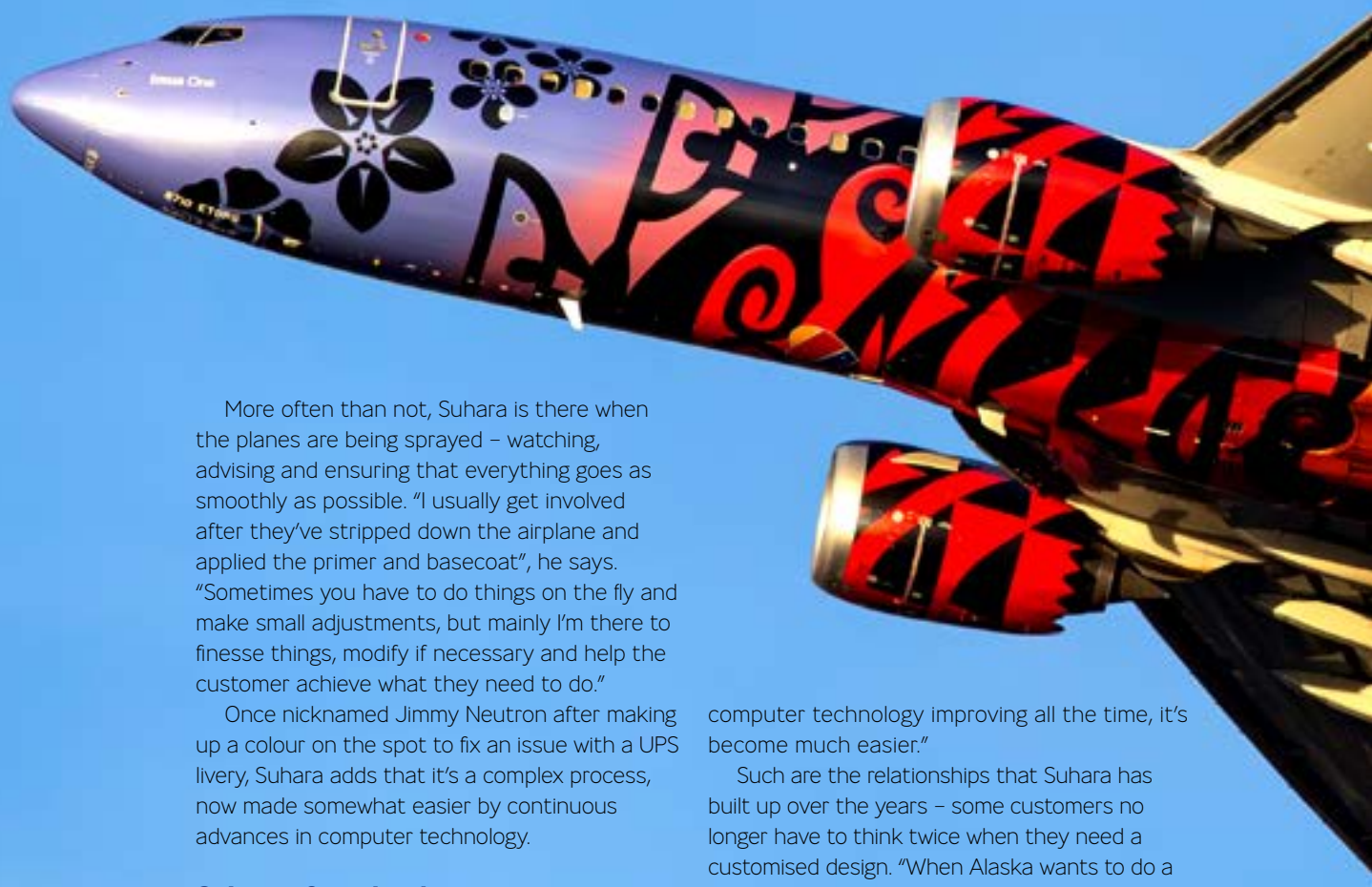
“The thing about paint is that it’s usually the last thing people think about, but it’s the first thing you see,” explains Suhara, who used to paint the stunt planes flown by Bob Hoover, widely considered to be one of the founding fathers of modern aerobatics.

Partnering with customers

Suhara’s main involvement with the special liveries revolves around partnering with customers to determine the perfect colours and agree on how they’ll be applied. “We always invite our customers and their designers to our Troy [Michigan] site, so they can meet with our colour experts to ensure they end up with the precise colours they want,” Suhara continues.

“The Toy Story plane is a great example. Disney is very particular when it comes to colour, so we wanted to make sure that if you go to Pixar Pier at Disneyland Resort, the colours you see will be exactly the same as the ones on the Alaska Airlines plane we coated.”

> “Working for AkzoNobel, I’ve experienced numerous changes over the years, as we’ve continued to develop and integrate next-generation technologies.”



More often than not, Suhara is there when the planes are being sprayed – watching, advising and ensuring that everything goes as smoothly as possible. “I usually get involved after they’ve stripped down the airplane and applied the primer and basecoat”, he says. “Sometimes you have to do things on the fly and make small adjustments, but mainly I’m there to finesse things, modify if necessary and help the customer achieve what they need to do.”

Once nicknamed Jimmy Neutron after making up a colour on the spot to fix an issue with a UPS livery, Suhara adds that it’s a complex process, now made somewhat easier by continuous advances in computer technology.

Science & technology

“When you apply a design to a fuselage, there are lots of things to consider, such as the multiple compounds and all the various curves and contours. That’s why working closely with designers and applicators is so important. People who can visualise design concepts on aircraft are rare, because it takes someone with a little bit of a bent mind to actually understand how it all works. But now, with computer technology improving all the time, it’s become much easier.”

Such are the relationships that Suhara has built up over the years – some customers no longer have to think twice when they need a customised design. “When Alaska wants to do a special livery, they come straight to us,” he notes. “It’s the same with Southwest Airlines, who really like our Aerodur basecoat/clearcoat system.”

He’s quick to point out, however, that it requires a big team effort. “There are hundreds of people behind me that make me look good. Over the years, I’ve had the pleasure of working with lots of great people, and they’ve taught me many things that I apply to what we do today.”

Southwest Airlines really like AkzoNobel's Aerodur basecoat/ clearcoat system

Aviation innovation

With technology constantly changing, new ways of working are inevitable. One of the most recent developments in aircraft art is the use of inkjet printing to apply designs. "Inkjet printing is really light, because it's extra thin, but the ink can fade quickly," Suhara continues. "What we've found is that it works best in combination with our products. It's applied on top of our Aerodur 3001 white basecoat – then they paint over it with our Aerodur 3002 clearcoat. This basically means they can put any picture on the side of a plane – how exciting is that?

"It's just another great example of how we're painting the future – finding new ways that our products can be used and applied. Working for AkzoNobel, I've experienced numerous changes over the years, as we've continued to develop and integrate next-generation technologies. And who knows where we'll go next? I can't wait to find out." ■

LIGHTWEIGHT AERO-PAINT

easyJet is the first airline in the world to trial a new paint solution, with MRO specialist MAAS Aviation painting the aircraft at its Maastricht facility.

The easyJet airline has become the first in the world to trial a new state-of-the-art lower-weight paint, which will enable the operator to make further savings on fuel.

easyJet and its partner Mankiewicz Aviation Coatings have developed a new system that reduces the amount of paint previously needed to create the iconic easyJet livery colours. The innovative solution has already been applied to 38 aircraft and will be rolled out gradually to easyJet's entire fleet, with the airline due to complete the transition by 2030.

While the lighter-weight coat generates a relatively modest impact per plane (27kg weight reduction), complemented with other fuel reduction methods and applied to entire fleets, this could provide another important method of reducing carbon emissions for the sector, and is one of many initiatives that easyJet is using to effectively reduce emissions and fuel burn.

The 38 easyJet planes that have been coated with the new paint are already delivering fuel savings thanks to their lighter weight, and once rolled out to the entire fleet will account for a 1,296-tonne fuel reduction – equivalent to a 4,095-tonne reduction of carbon emissions.

Net zero roadmap

Eventually, and complementary to the airline's sustainability strategy and roadmap to net zero, the lightweight paint is expected to contribute to an overall saving of 1,296 tonnes of fuel per year – once the roll-out is completed at the end of 2029.

"easyJet is constantly exploring and developing innovative solutions to lower the impact of our operations," explains Lahiru Ranasinghe, Director of Sustainability at the airline. "While this forms a small part of a

bigger strategy, formulating a new lightweight paint with our partners at Mankiewicz Aviation Coatings exemplifies how we're assessing every single part of our operation to find efficiency gains to help us achieve this mission."

"We are pleased to have been easyJet's chosen coatings partner for the last 15 years and to have worked on this sustainability-driven project," says Andrew Richardson, Aviation Sales Manager at Mankiewicz Aviation Coatings. "We took the project one step further by optimising the colour formulations in order to minimise the amount of 'paint film build' needed to achieve the iconic easyJet livery colours. Sustainability and environmental guardianship are at the heart of Mankiewicz's core values and being able to work closely with easyJet on this has been very rewarding."

"Environmental responsibility is taken extremely seriously throughout our operations at MAAS," says Richard Marston, Chief Commercial Officer at MAAS Aviation. "We work closely with our supply chain to ensure we use the latest technology products that deliver the highest standards of performance and finish, while reducing the impact on the world around us. We are very proud to be part of such a groundbreaking initiative."

Since launching its roadmap to net zero two years ago, easyJet continues to work hard to find solutions that will help decarbonise the aviation sector. ■

KEEPING FOULING UNDER CONTROL

***Ariana Psomas, PPG Global Segment Director, New Build & Dry Dock, Marine Coatings*, explained how adopting low-friction silicone coatings can help the cruise industry to meet sustainability goals at Seatrade Cruise Global.**

Electrostatic application of silicone-based coatings significantly reduces coating overspray and therefore minimises the need for masking

Underwater fouling control hull coatings were once purely a commercial consideration for shipowners and operators. Now it is also a question of how they can help meet global goals to reduce greenhouse gas (GHG) emissions. A ship slowed by fouling means higher fuel consumption, which translates directly into higher emissions intensity.

The International Maritime Organization's (IMO's) Green House Gas (GHG) reduction strategy is constructed in the short term around the CII (Carbon Intensity Indicator) and EEXI (Energy Efficiency Existing Ship Index) measures, with more measures under development for the medium and long term. It calls for a reduction in GHG emissions by at least 20% compared with 2008 levels by 2030, and by 70% by 2040, as well as reducing total emissions to net zero by 2050.

For cruise owners and operators, the ability to achieve savings of this magnitude requires radical improvements in design and in operating efficiency, and selecting the right coating solution is of utmost importance. It is this realisation that is prompting leading cruise companies to adopt low-friction silicone coatings as the technology of choice as they can directly shift the speed-power curve and at the same time improve operational efficiency.

Increasing pressure

Increased sustainability pressure is coming from all shipping industry stakeholders. Consumers are increasingly demanding more sustainable practices, putting pressure on cruise lines to adopt new measures. Leading the way on sustainable practices can position cruise organisations as sustainable innovators within their industry.

> "For cruise owners and operators, the ability to achieve savings of this magnitude requires radical improvements in design and in operating efficiency, and selecting the right coating solution is of utmost importance."

To help meet these challenges, PPG offers PPG Sigmaglide 2390 fouling release hull coating, based on a 100% pure silicone binder system. This biocide-free product helps to reduce emissions by up to 35% compared with traditional antifoulings, supporting compliance with short-term and upcoming IMO GHG measures and providing a significant contribution to industry net zero targets. It provides up to 35% GHG savings, delivered through the combination of reduced power (up to 20%) and speed loss performance of less than one per cent.

Further sustainability benefits are provided by the innovative electrostatic coating application technique that PPG introduced to the shipping industry just over a year ago. This method offers significantly higher transfer efficiency compared to airless spraying, as the electrically-charged paint particles are precisely guided toward the grounded surface of the vessel. This leads to an exceptionally even distribution and formation of a uniform and ultrasmooth, long-lasting film layer, and also results in a significant reduction of overspray and waste, providing a considerably cleaner operation. PPG Sigmaglide fouling release coating's unique formulation makes it one of the very few hull coating technologies suitable for electrostatic application.

More advantageous

Silicone-based coatings have long been recognised by cruise owners as the most effective solution for demanding operations. When applied electrostatically, these coatings become even more advantageous for the cruise industry. In particular, it solves the issue of contamination of the accommodation areas during spraying. Electrostatic application significantly reduces coating overspray and therefore minimises the need for masking on the hull and accommodation areas.

The integration of electrostatic application with silicone-based coatings not only enhances operational efficiency but also aligns with the cruise industry's commitment to sustainability. This innovative approach ensures cleaner, more efficient coating processes, setting a new standard for environmental stewardship in maritime operations. ■

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SPOTLIGHT

Assess your access: A critical consideration for painting attractions

When amusement park operators and maintenance directors plan to bring in contractors for painting or restoration work on attractions, one often overlooked yet vital factor is access, says *Melissa Bamford, Director of Marketing at Baynum Solutions.*

It's not just about the work itself – painting attractions requires reaching every square inch of a structure. For companies like Baynum Amusement Solutions, where precision and quality are paramount, understanding how to access each area of a ride or attraction is critical to achieving long-lasting results.

Here, we'll explore why assessing access is crucial, how it impacts project scope and costs, and how choosing an experienced contractor with a proven track record in complex environments can save time, money and hassle.

Why access assessment matters

I. Complete coverage is non-negotiable

In professional attraction painting, the coatings we use demand precise application techniques. Unlike other industries where spraying may suffice, attractions require brushing and rolling to ensure complete coverage, adhesion and compliance with manufacturer specifications. This eliminates the risk of overspray – a concern when working with high-performance coatings that can travel great distances due to their chemical composition.

Failing to reach every surface compromises the protective benefits of the coating and can leave critical areas exposed to corrosion, UV damage and general wear. For operators, this means potential safety hazards, higher long-term costs and diminished aesthetic appeal.

2. Equipment determines feasibility

Every ride has its own unique challenges when it comes to access. From towering steel roller coasters to winding waterslides, no two structures are alike. A thorough assessment ensures we know exactly how to reach each area. Will a standard man lift work for the entire project, or will swing stages, spider baskets or cranes be necessary?

Access methods directly impact the project timeline, cost and even safety protocols:

- **Man lifts:** Efficient and cost-effective for most projects but limited by terrain and height.
- **Swing stages:** Ideal for vertical surfaces but require extensive setup.
- **Cranes:** Necessary for extreme heights or inaccessible areas but come with significant logistical planning and expense.
- **Spider baskets**: Perfect for tight spaces or intricate layouts, but require skilled, experienced operators due to their complexity.
- **Scaffolding:** Reliable for multi-height access but time-intensive to set up and dismantle.

By understanding these limitations upfront, we can determine the best approach to balance efficiency, quality and cost.

Every ride has its own unique challenges when it comes to access

> “Our expertise, combined with our trusted supplier and rental equipment partnerships, guarantees quality results – even in the most challenging environments.”

Challenges to consider

I. Ground conditions

Accessing an attraction isn't just about height – it's about what's under the equipment. Can the ground support heavy equipment? Wet soil from recent rain, fragile decking or underground utilities can all create complications. In such cases, alternative solutions may be necessary, like mats to distribute weight or specialty equipment designed for rough terrain.

2. Obstacles on the ground

Fences, landscaping, and surrounding structures often restrict the placement of lifts or cranes. Sometimes, these obstacles mean we need to use a crane just to lift equipment into place before we can even start work.

3. Weather and environmental factors

Even with the right plan, external factors like wind, rain or extreme heat can delay operations or require changes to equipment and schedules. A contractor experienced in working under these conditions will anticipate potential delays and include contingency plans in their project timelines.

The cost implications of access

Access isn't just a logistical consideration – it directly impacts the bottom line. Not only do the types of access equipment needed affect costs (e.g. man lifts vs cranes), but thorough access assessments early in the bidding process are critical to avoiding unpleasant surprises later.

While clients may provide site details, it's easy for some factors like obstacles, terrain or height challenges to be unintentionally overlooked. When these issues arise mid-project, they often lead to unforeseen change orders that result in delays and additional costs. To mitigate this, we emphasise the importance of on-site evaluations to identify these challenges early and establish an accurate plan of action.

When in-person visits are impractical, we collaborate with our trusted lift partners. Their expertise and tools, such as laser rangefinders, allow us to evaluate access requirements remotely with precision. By taking these proactive steps, we help ensure projects remain on time, on budget and free of unnecessary surprises.

Best practices for park operators

If you're considering painting or restoration work on your attractions, here are some steps to ensure success:

I. Conduct a pre-project assessment

Collaborate with your contractor to review the attraction's layout and identify access challenges. Bring attention to any potential ground issues, surrounding structures or unique ride features.

2. Request a detailed access plan

Your contractor should provide a clear plan outlining how each area will be reached, what equipment will be used and the estimated costs for each method.

3. Plan for contingencies

Access challenges can arise unexpectedly, so build some flexibility into your project timelines and budgets.

4. Choose an experienced contractor

Look for contractors with a proven track record in amusement park projects. Their experience will minimise delays, improve quality and ensure compliance with industry standards.

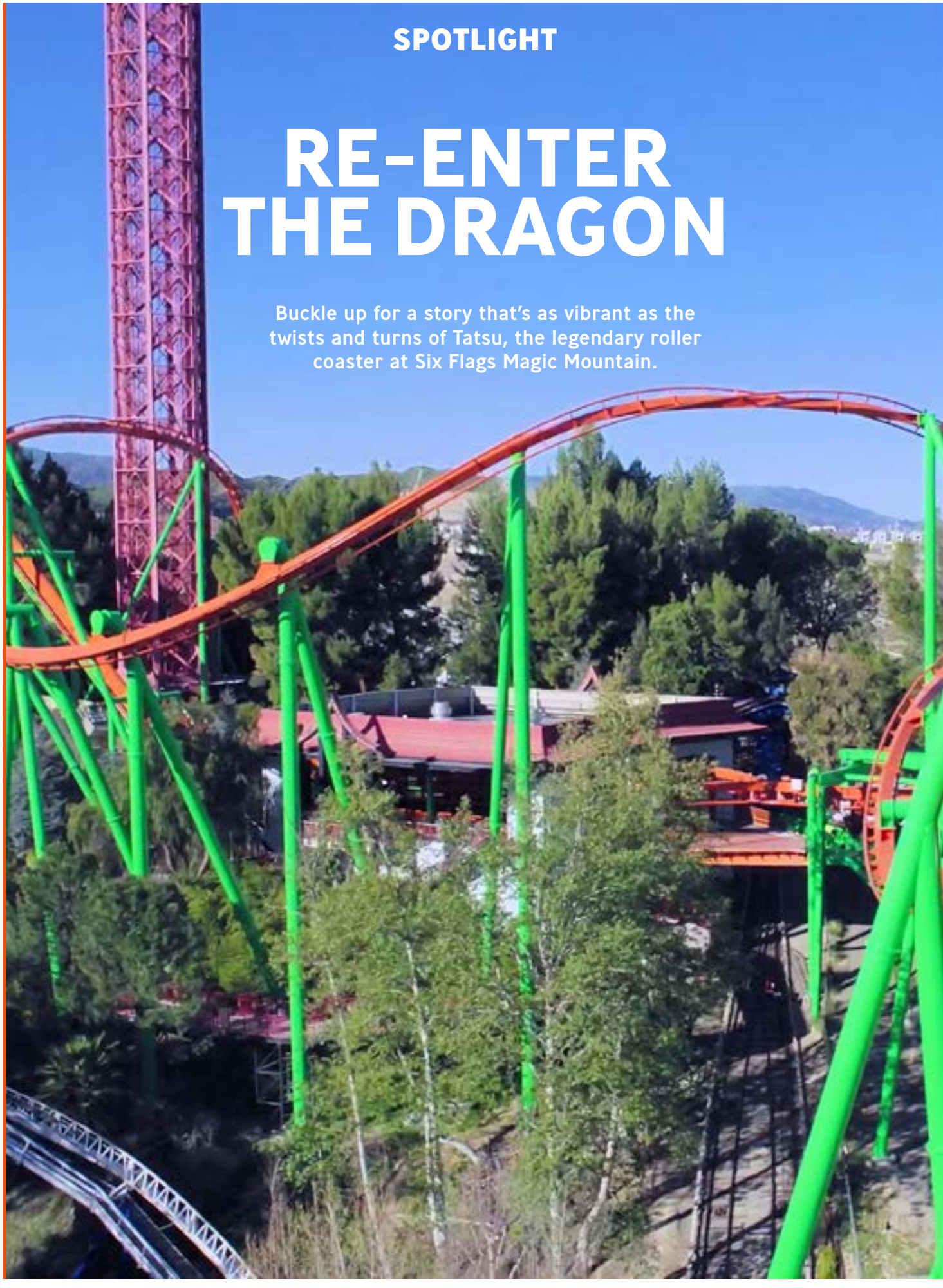
Where it all begins

At Baynum Amusement Solutions we believe that proper planning is the foundation of any successful project. By thoroughly assessing access needs, we ensure that every inch of an attraction receives the care and attention it deserves. This attention to detail not only preserves the integrity and safety of your assets but also protects your investment for years to come.

When you partner with us, you're choosing a company that understands the intricacies of amusement park painting and restoration. Our expertise, combined with our trusted supplier and rental equipment partnerships, guarantees quality results – even in the most challenging environments. ■

RE-ENTER THE DRAGON

Buckle up for a story that's as vibrant as the twists and turns of Tatsu, the legendary roller coaster at Six Flags Magic Mountain.



➔ Before (left) and after (right) Tatsu was repainted

After 16 years in the punishing California sun, Tatsu, the iconic dragon roller coaster that dominates the skyline at Six Flags Magic Mountain in Valencia, needed an exciting new look that matched its scream-filled ride. The park wanted both a refresh and a dazzling colour update that would turn heads and sell tickets.

When Six Flags Magic Mountain turned to Baynum Solutions, the company knew it was time to shine. Its mission was not just to repaint a coaster but to redefine its identity.

Baynum takes pride in the experience and the relationships it has built. Being the go-to team for amusement park transformations is not just a title; it's a testament to the trust clients place in it.

Baynum's secret starts with partnerships. The company teamed up with PPG for cutting-edge coatings, but it's more than that. It's about the years of collaboration, the understanding of what works best, and the assurance that when Baynum takes on a project, it doesn't just bring the paint to the table, but expertise.

Tatsu's transformation

A new colour scheme is not just a fresh coat of paint – it's a statement. That credit goes to the park – Six Flags had a vision, and Baynum was able to bring it to life. The vibrant green and orange was all Six Flags, and Baynum was more than happy to wield the brushes. Visitors are not just witnessing a refreshed coaster; they're experiencing the magic of a brand-new ride.

But there were challenges. The topography of Tatsu's location made this one of the trickiest projects Baynum has ever taken on. Getting to the coaster for the paint job wasn't a walk in the park – literally. Navigating the terrain and ensuring access to every nook and cranny of Tatsu was a puzzle Baynum was determined to solve.

This was not just a routine paint job; it was an intricate dance with the landscape. The twists and turns of Tatsu were not limited to the coaster itself, but extended to the challenges faced in reaching every inch of its steel structure.

What sets Baynum apart? It's not just the brush strokes or the vibrant colours. As the leading choice in amusement park transformations, the company's value proposition is simple: it brings more than just a service – it brings a legacy of excellence, a commitment to innovation, and a track record of turning ageing roller coasters into the stars of the show.

The solution

Amerlock 2 epoxy spot prime and a topcoat of PPG PSX 700 epoxy siloxane from PPG Protective and Marine Coatings and distributed by The Pittsburgh Paints Company brought back the beast in a single application. Six Flags Magic Mountain chose the Amerlock 2 and PPG PSX 700 system for its durability and long-lasting protection of the coaster's steel structure. A brilliant new green and orange colour scheme makes the attraction a sight that park visitors can't miss.

The benefits

PPG PSX 700 topcoat provides long-term protection of valuable steel assets, especially in aggressive exposure conditions. It has unsurpassed long-term retention of colour and gloss characteristics, and it resists fading, chalking and general deterioration over time. It requires fewer coats than traditional finishes and is virtually maintenance-free.

The result

Tatsu has an exciting new look and long-term protection provided by PPG PSX 700 topcoat. Its classic thrills and chills have a new lease on life. ■

↑ Challenges were faced in reaching every inch of the steel structure

LIFTING THE LID

A look at the more technical aspects of paints & coatings, corrosion investigation & prevention

PINHOLES & HOLIDAYS

Coatings are the principal protection materials used for steel exposed to atmospheric conditions, whether the structure is in a refinery, chemical plant, shipping, offshore platform or bridge.

Coating 'failure' is best described as the inability to withstand exposure conditions and continue to effectively protect the substrate. The term 'failure' also covers the situation when a coating has reached the end of its service life. It is important to differentiate between coating 'failure' and coating 'breakdown'. Identification of whether one is dealing with failure or breakdown is an important factor, so that appropriate remedial measures can be taken.

This article is not all-inclusive; the intent is to provide a general insight into some of the causes related to coating failures, particularly in relation to pinholes and holidays.

Protective coatings are complex materials made up of many interacting ingredients, with all having a finite service life. In other words, they gradually degrade on atmospheric exposure largely due to chalking, losing the ability to protect the steel.

Chalking can best be described as the formation of a relatively loose organic powder on the surface of a paint coating after exposure to the weather, and in particular to ultraviolet rays. Modern-day coatings are predominately organic materials. As more of the coating is exposed, the quicker will be the tenancy to chalk, which is a continuing process as atmospheric conditions remove the powdery substance, exposing fresh material for the process to continue over time. Chalking has been known to range from a few microns to 20µ per annum.

A coating can only provide protection if it forms a continuous film, free of defects or physical stresses caused by handling, transport and erection. Two major contributors to the corrosion cycle and coating failure are pinholes and holidays.

These aspects are largely dictated by coating type, film thickness, water vapour transition rates and UV resistance. The principal reason for coating failures depends on proper application techniques to eliminate pinholes and holidays.

Pinholes

Pinholes can be defined as the formation of minute or micro holes in a film that occur during application or curing, largely due to trapped air or solvent gas displacement that tries to burst through a partially-cured film, forming small craters and holes when trying to exit the film.

The film at this stage has started to plasticize, which impedes solvent release, resulting in pinholes that fail to flow out before the film has set. Pinholes can range up to a few millimetres in diameter. Modern coating materials often contain high volatile solvents which accelerate this process as the solvent endeavours to exit the film through a semi-cured coating which is no longer totally fluid, leaving a pinhole in its wake.

In the world of atmospheric corrosion, steel corrosion is a complex electrochemical reaction that occurs when bare steel is in the presence of an electrolyte such as water, oxygen, and chlorides containing airborne pollutants. The accepted theory of corrosion involves the transport of the electrolyte through a protective coating film to the steel substrate, explains *Nick Karakasch, the retired principal of Total Corrosion Consultants, Melbourne, Australia.*

Holidays

Holidays can be described as any discontinuity or uncoated area where pinholes pass through the coating material, resulting in contained air bubbles. In extreme circumstances air pockets can represent a substantial portion of a total coating thickness, even if the coating appears to be continuous. Since the accepted theory of corrosion relates to the electrolyte, it is vital that the correct materials and application procedures are employed. The quality of application and environmental conditions need to be recognised and controlled to minimise not only pinholes but also rough dry spray or overspray — all of which contribute to the pinhole effect.

With rare exceptions, water is always involved in the corrosion process, and is known in the industry as the 'universal solvent'. Over time it is capable of migrating into and through most organic coatings carrying oxygen and soluble chlorides. This depends on film thickness and coating formulation. Most protective coatings are formulated in what are known in the paint industry as high molecular dense materials, meaning they are tightly structured to resist the vapour transition.

Best performers

The best performers overall are the two-pack catalysed materials such as polyurethane and epoxy. Polyurethanes in particular also have outstanding UV resistance, which reduces chalking.

When these defects occur, they can normally be resolved by dealing with these applications openly so that the issue of what the customer expects versus what the customer receives can be dealt with before the products are specified, sold or applied.

The acceptability does vary with the client (or individual inspector) and also with the structure being coated. The vast majority of complaints are on large steel sections such as ships' hulls and tank areas, etc. Appearance on smaller steel sections is less noticeable. In some cases, pinholes are barely visible to the untrained eye, but highly visible through eight times magnification. Larger pinholes can be cause for questioning or rejection and will require correction because appearance is less than expected.

There is no perfect coating system that will satisfy the demands of every environment or set of application conditions. Usually, a system approach of a properly selected primer, intermediate and topcoats provides the best answer to the requirements for a specific coating problem.

As a wide variety of paint materials are used, solvent and air bubbles will inevitably be present to some degree in all systems. In extreme circumstances, air pockets (holidays or small missed areas) can represent a substantial portion of the total film thickness, and as such are a weak point. If they are not patched they can become focal points for corrosion.

Technology advances

Technological changes have resulted in the development of many coatings of a specialised nature, which has enhanced corrosion resistance properties. These include improved resistance to UV, chemical and marine attack, heat, water penetration, abrasion and gloss retention. They were largely developed as a complete system based on primer, intermediate coat, and finally topcoats.

There is no guarantee that a coating system can be considered totally pinhole- or holiday-free. What contributes to this problem is coating type, thickness, application method and the extent of any contaminants that may be left on the surface after surface preparation. Neither will they totally insulate the steel surface from the environment (electrolyte). All coating materials are vulnerable 'over time' to some degree of oxygen and vapour transmission.

Whilst the creation of pinholes and holidays is not all straightforward, in simple terms it can for the most part be attributed to shrinkage of the coating as the solvent permeates out of the film, particularly under hot air conditions where contaminants or trapped air/solvent is present, which prevents the paint wetting out the surface.

Zinc coatings

Metallic zinc coatings, especially inorganic zinc silicate materials, are an area requiring special attention as the occurrence of pinholes is highly predictable and common. In most cases top coating is not generally recommended unless applied over an intermediate tie coat. The potential for pinholing or blistering is dependent on both the specific metallic zinc coating and the topcoat system. Pinholes where metallic zinc materials are used as primers are normally not detrimental to coating system performance except in those environments where rapid attack of the zinc can occur, such as in acid or alkaline environments below a pH of 5.5 or above a pH of 11.

Inorganic zinc coatings by nature contain varying degrees of porosity in the dry film. This decreases on weathering as zinc corrosion products, if any, fill the porosity. The porosity of these materials does have a significant influence on both the selection and application of topcoats. The application quality must be controlled to minimise topcoat pinholing, rough dry spray or overspray, all of which will increase topcoat pinholing. However, these can be minimised in a number of ways, with the most accepted method being the mist coat-full application technique, as this can be used effectively over recently-applied material to prevent craters, intact blisters and pinholes.

(All images) Delamination coating failure of epoxy/polyurethane duplex coatings on hot dip galvanized surfaces resulting in the accumulation of zinc corrosion products

When pinholes are present, the finish coat can reflect the same condition, and in most cases can be corrected by applying an additional spray pass during finish coat application.

The owner/specifier/fabricator/applicator and inspector, if not familiar with top coating inorganic zinc, should be aware that:

- Some pinholes may occur
- Application and repair techniques can assist in eliminating pinholes
- These items must be considered when estimating material and labour requirements.

Organic zinc coatings do not suffer anywhere near the same problems as inorganic materials as they are not porous and incorporate a variety of organic binders such as epoxy, or polyurethane.

Hot dip galvanizing

The other serious area of vulnerability involves hot dip galvanizing where the structure requires duplex topcoats, for architectural or extra corrosion resistance. There is no doubt that the performance of duplex materials has developed a poor reputation — largely as those involved in the chain of events have often failed to recognise the corrosion mechanisms associated with duplex coating.

Pinholing and the permeability of the electrolyte has a marked impact on overall performance.

To gain mechanical adhesion (surface profile) requires abrasive sweep blasting. When an item leaves the galvanizing kettle, there is a reaction with oxygen that produces a clear durable carbonate film on the surface which is then removed by the sweep-blasting process, exposing pure solid metallic zinc.

When diffusion of the electrolyte occurs, it activates the protective properties of the zinc. The result is the accumulation of zinc corrosion products (zinc oxide, hydroxide and carbonate) which are trapped beneath the duplex material at the interface with nowhere to go except upwards.

These corrosion products are concentrated solutions and are hygroscopic; the laws of physics dictate that you cannot have a concentrated solution on one side of a 'permeable membrane', therefore more of the electrolyte is absorbed, weakening the coating integrity to equalise the solution on both sides. The result is that the zinc protective properties continue unabated, increasing the volume of corrosion products, ultimately leading to adhesion failure of the duplex coating system.

Whilst there is no corrosion in the early stages, rapid failure can occur due to accelerated corrosion at the zinc/paint interface. However, the failure of the duplex topcoats becomes extremely unsightly and very costly to rectify with no guarantee that it would not happen again.

Surface contamination

A major concern that adds to pinholing and holidays is the effect of surface contamination. Paint coatings require good wetting properties so that the molecules can flow freely to achieve chemical adhesion. Chemical affinity occurs when surface atoms swap or share electrons to form a bond. Contamination interferes with sharing electrons, and therefore adhesion is compromised. The major source of contamination comes from the galvanizing process, in the form of chromate deposits.

The last procedure in the galvanizing process is quenching in a solution of sodium dichromate which is necessary to avoid early flash rusting that leaves a chromate deposit on the surface. From a duplex coating perspective, this must be totally removed prior to abrasive whip blasting which is necessary for mechanical adhesion. Chromate solutions are also water soluble and hygroscopic, which is another factor that contributes to the increase of the electrolyte uptake.

Note, quenching should be avoided if items are to be duplex coated and this should be reflected in the tender/specification documents and reinforced at the preconstruction meeting. In my

> “It is important to understand that a coating can only provide corrosion protection to the underlying steel substrate when it is free of any defects that allow any corrosive agents such as an electrolyte to contact the steel substrate.”

experience, degreasing has not been a common practice, largely due to the general perception and misunderstanding that structural members received from galvanizing have no surface contaminants. Painting contactors need to be informed that degreasing is a necessary requirement.

Inorganic zinc coatings consist of fine metallic particles held in an inorganic matrix and do not suffer the galvanizing problem. Degreasing and abrasive whip blasting for adhesion purposes is not necessary. Being somewhat porous, zinc corrosion products are absorbed into the film, hence the reason top coating is always more reliable. In my experience it is rare that topcoat materials delaminate; failure is generally associated with applications well over recommended thickness requirements, or breakdown caused by atmospheric exposure, mainly due to chalking.

Performance

From a performance perspective, over-coating any zinc-based material provides an important feature — a synergistic effect — meaning working together or a combined action to increase performance. Therefore, it is vital to anticipate any possible defects that may occur in advance prior to selection and application, to ensure extra performance as expected is not compromised.

In many cases, most pinholes do not extend completely through the coating since very little or no holidays are indicated when a 100—250µ dry film containing visible pinholes is tested with a holiday pinhole detector. Although they are generally considered aesthetically not acceptable, they are repaired as part of the normal coating application process. Like inorganic zinc, if owner/specifier/fabricator/applicator and inspector are not familiar with top-coating galvanized surfaces, they need to be made aware that:

- Some pinholes are likely to occur
- Application and repair techniques can assist in eliminating pinholes
- These items must also be considered when estimating material and labour requirements.

Inspection

Inspection and knowledge are the keys to minimising the possibility of premature failure and ensuring that coatings are applied to the extent and quality implicit in the contracting/client’s specification. Holiday/pinhole detection equipment can locate these even on sharp edges where a coating is most likely to be deficient. It is important to understand that a coating can only provide corrosion protection to the underlying steel substrate when it is free of any defects that allow any corrosive agents such as an electrolyte to contact the steel substrate.

When the integrity of the coating film is damaged or compromised, the rate of any resultant corrosion is a direct consequence of the corrosive potential for any given service environment. From a pinhole perspective, there is no absolute threshold at which a coating can be considered as pinhole-free.

Testing for these defects is necessary where coating integrity is paramount — the reason being that application is so operator-dependent. Therefore, a number of inspection measurements taken over a specific area rather than isolated determination is usually more accurate.

> “Pinholes and holidays are critical factors when selecting a coating system fit for purpose in combination with application techniques to ensure money is well spent.”

Electrical testing is essential to ensure a coating is free from these defects. It is particularly required where in-service inspection is difficult, such as in immersed conditions for tank and pipeline coatings etc. where defects of this nature cannot be tolerated.

Quality control

Quality control throughout the whole process from design to final inspection is essential to ensure the coating film has been applied with film continuity. This is particularly important in conditions where the environment is considered severe. If not, this will lead to premature failure, resulting in higher maintenance costs and the possibility of revenue loss or production.

The extent of pinholing can to a large degree be divided into broad categories of low-build coatings and high-build materials:

1. Low-build materials range in thickness from 50-100µ, tend to be for architectural purposes, and in the majority of cases are not pinhole free.
2. High-build systems range from 100 to in some cases 400µ-plus, depending on environmental conditions of exposure. Thicknesses above 300µ tend to be high enough to inhibit initial diffusion.

Paint systems will not completely insulate the steel substrate from the electrolyte as there is no guarantee that pinholes will not occur in areas of low film thickness. Defects of this nature can be attributed to shrinkage of the coating as solvent permeates out of the film, air temperature, and surface contaminants if any prevent the coating wetting out the surface. In moderate or benign conditions these defects are of little consequence. However, in marine, industrial, immersed or high humidity conditions they become a point of vulnerability.

For film thicknesses above 250µ, the likelihood of these defects is greatly diminished and will not prevail with all paint systems, but generally only where the paint system has a relatively high permeability to the electrolyte (typically materials below 100µ). This includes low-film and high-permeability paints such as exterior water-based latex materials or enamel paints where diffusion is high. These generic types should not be recommended in corrosive or high humidity environments.

Conclusion

Finally, it is important to remember that a coating system can only provide protection to underlying steel substrate when it is free of any defects that allow any corrosive agent such as an electrolyte to contact the steel substrate. When the coating integrity is damaged or compromised, the rate of any resultant corrosion is a direct consequence of the corrosion potential for any given service environment. Pinholes and holidays are critical factors when selecting a coating system fit for purpose in combination with application techniques to ensure money is well spent.

Recognising the type of coating failure can feed back into future specifications to avoid repeated failures. Coating systems have to operate effectively to ensure the selection is capable of delivering the lifecycle performance expected. Coating assessment is important because it helps understand the cause/s of failure or breakdown. ■

Inorganic zinc-rich coatings: How they work, and how they can work better

Stakeholders interested in corrosion prevention are broadly aware that zinc is an excellent material for protecting assets in harsh environments, says *Carboline.*

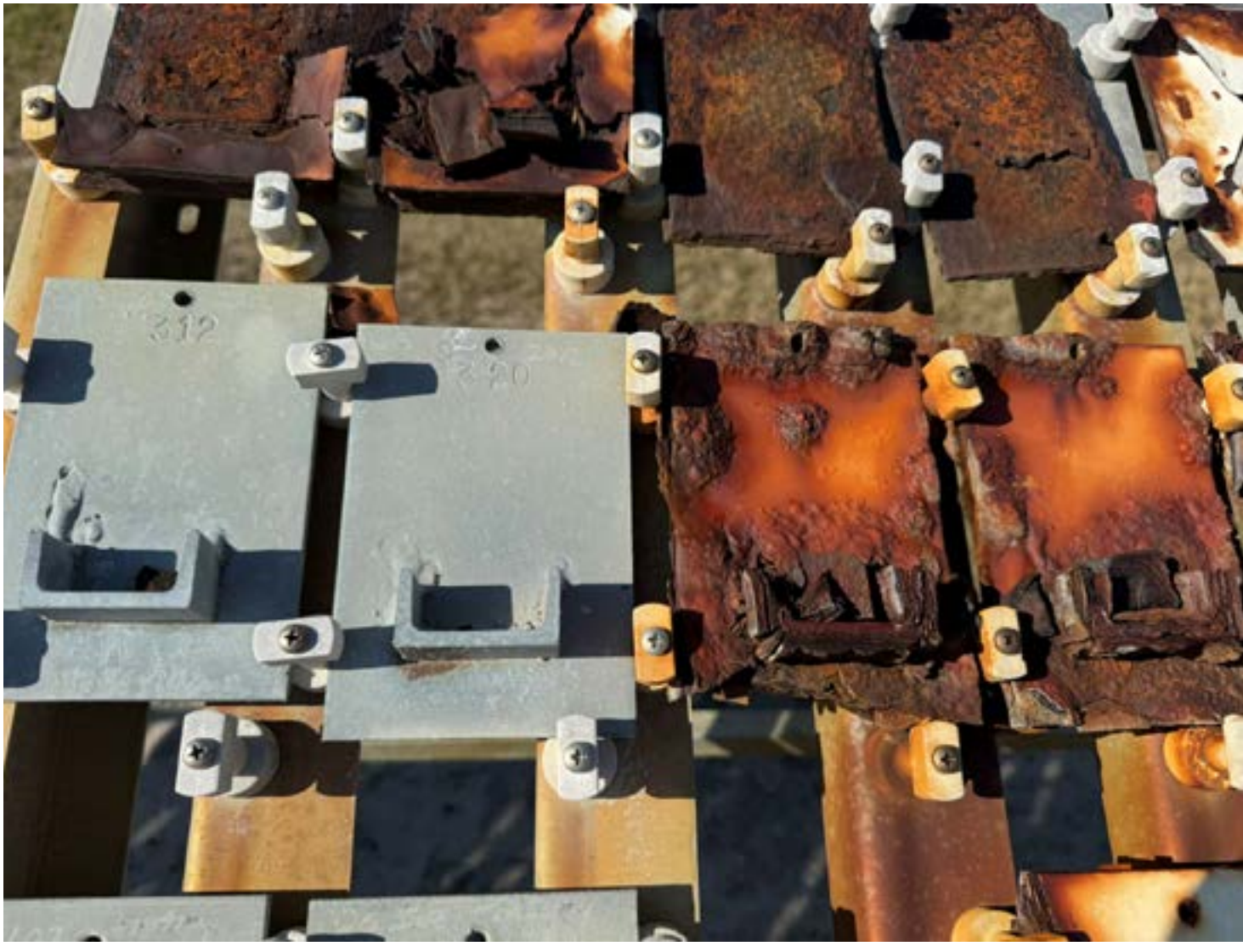
Many also know *why* it works — anodes, cathodes and the galvanic series — so that is not being summarised here.

But in the world of liquid-applied protective coatings, the interactions among zinc, other constituents in a coating formula and the environment are rarely described in any detail. And as Carboline explains, it's a crucial description because it sends us two important messages. One is that, for the most part, the coatings industry has not got all that it can out of zinc-rich coatings. That has been to the detriment of customers, their assets and the environment. And two: the recipe for doing better is no mystery. The industry has what it needs — and has had it for decades.

The behaviour of zinc in inorganic and organic systems

In zinc-rich coatings, the reaction between zinc and the atmosphere is the key to the extended corrosion protection we are all familiar with.

Immediately upon its exposure to the environment, zinc reacts with oxygen, moisture and carbon dioxide in the air to form numerous reaction products. These products fill in microscopic pockets in the coating film over time, a process that continually reinforces the structure of the coating and is essential to its overall protective properties.



↑ Panels at NASA's beachside corrosion test site

But the coating's resin type is also instrumental to its performance. Inorganic zinc-rich coatings are typically based on silicate resins made of the same chemical toolkit as rocks or sand. Silicate-resin based coating films are relatively permeable compared to epoxy resins. That allows moisture to move through the film for continued curing of the silicate resins as well as reacting with zinc to continually reinforce the coating.

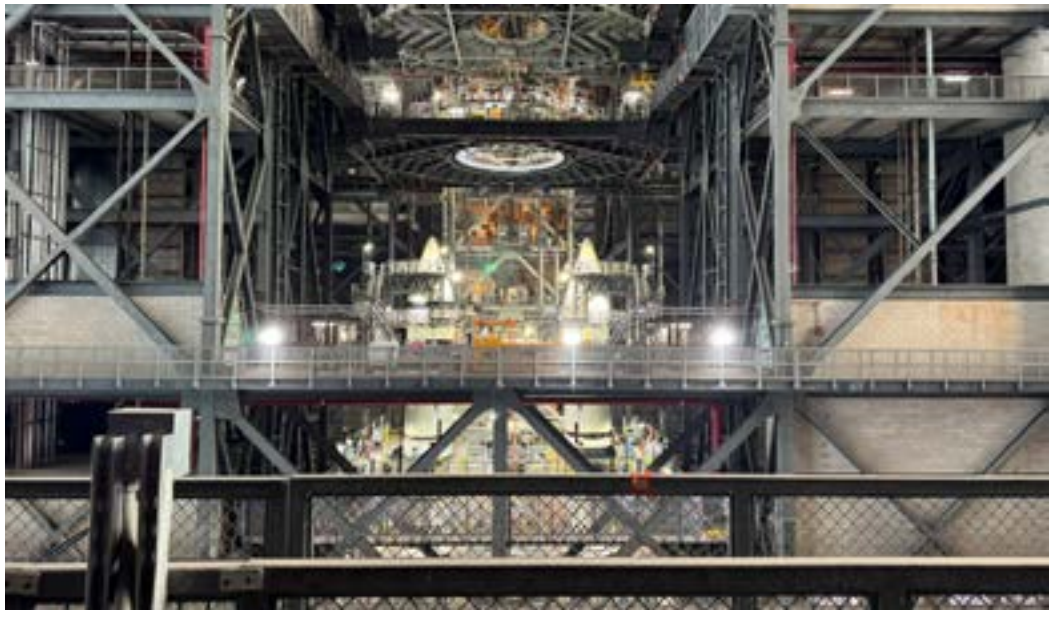
The zinc compounds fill the pores in the silicate resin matrix, creating a physical barrier between the substrate and its environment. The zinc also reacts with the silicate resin and the iron in steel to form a chemically bound complex. When moisture is present, the circuit is completed and cathodic protection is activated. This corrosion-resisting barrier lasts a long time because inorganic resins do not degrade under UV exposure.

So unlike their organic counterparts that weaken over time, inorganic zinc-rich coatings strengthen as they age.

Emerging problem

However, a problem emerges. A widely-used corrosion protection system involves an inorganic zinc-rich primer under one or two organic epoxy or urethane coats. But organic-resin based coatings are less permeable, and applying them over an inorganic zinc-rich primer insulates a portion of the zinc. That impedes its interaction with the atmosphere and fewer zinc compounds are formed as a result.

Compounding the problem is that all organic resins eventually break down under exposure to UV radiation. The corrosion-protective performance of an inorganic zinc-rich primer is handicapped by the introduction of an organic resin on top of it.



NASA's Vehicle Assembly Building in coastal Florida

The image opposite, captured by Carboline at NASA's beachside corrosion test site at Kennedy Space Center in Florida, illustrates the point. The panels marked 312 and 320 are coated in an inorganic zinc-rich primer. The two panels to their right are coated in organic-resin based materials. Both sets of panels were set out for testing at the same time.

Inorganic zinc-rich coatings vs galvanizing vs metalizing

No discussion of galvanic corrosion protection should exclude the other common ways to achieve it.

Galvanizing, in one form or another, has been around for centuries. It's well understood and well regarded as arguably the premier method for achieving long-lived corrosion protection.

Metalizing, a more recent invention, has gained traction for its apparent very strong performance, too.

NASA choose the Armorlast system for its new ML-2 launcher

How do liquid-applied coatings compare? It's hard to offer a definitive and scientifically valid performance comparison for two reasons:

- Neither galvanizing nor metalizing are subject to the same rigorous performance testing as paint — paint is held to a different and higher standard
- Variability in assets, surface preparation, application techniques, formulas, environmental exposures and other influences mean control conditions are difficult to achieve.

With that said, Carboline's stance is that a premium inorganic zinc-rich primer, when applied in one coat to a properly prepared surface, is equal or superior in performance to galvanizing. Galvanizing is usually marketed as a 50-year corrosion protection solution.

It's worth noting that the structural steel in NASA's Vehicle Assembly Building in coastal Florida was coated in a single layer of Carbozinc 11 in 1966. It was observed in excellent condition as recently as February 2025, 59 years later.

Metalizing is a new enough process that we need to see a 50-year performance history before agreeing that it was on par with inorganic zinc-rich coatings or galvanizing — and only time will tell.

Cost, application properties, and health and safety matters are easier to compare.

- Galvanizing is slower and metalizing much slower than applying paint; paint application equipment is far more portable
- Galvanizing and metalizing involve exposure to high heat and dangerous chemicals; the health exposures associated with using zinc-rich coatings and application equipment are quite mild by comparison
- Galvanizing is markedly more costly than painting—sometimes twice the cost per square foot for large steel members — while metalizing is monstrously expensive at three to four times the cost of painting.

Could two-coat inorganic systems maximise corrosion protection?

If inorganic zinc-rich coatings are such phenomenal performers when left alone, then why would we introduce the question of a two-coat system?

From a performance perspective, testing has shown that the additional inorganic coating layer may increase the system's durability and resistance to impact damage while still offering excellent galvanic protection. Test panels coated in Carboline's Armorlast two-coat inorganic system have shown virtually no degradation following exposure in back-to-back-to-back ISO 12944-9 cyclic ageing tests. A single test cycle simulates 25 years in the harshest, most corrosive conditions.

Indeed, compelling test data along with extensive past experience with inorganic systems led NASA to choose the Armorlast system for the structural steel of its new ML-2 launcher.

Beyond performance, another benefit that emerges is colour options. That is because with single-coat inorganic zinc-rich coatings, all you get is zinc dust grey. But an added inorganic finish coat means that more colours are available, and the days of giving up on performance for visual appeal, or vice versa, are finally over.

Owners of highly visible assets in harsh environments — offshore energy platforms or wind turbines, bridges, commodity storage terminals and more — are already taking notice.

Carboline says the performance benefits and cost savings speak for themselves, and they're too loud to ignore. ■

ENHANCING CORROSION PROTECTION IN THE RAIL INDUSTRY

Hexigone's 'smart' corrosion inhibitor was chosen for its superior corrosion protection in harsh environments.

Holyhead station is a prominent railway station in Wales in the UK. Strategically located near a harbour and high street, it serves as a key transport hub, seamlessly connecting the region's rail and maritime networks.

As a result, the Grade II-listed train station has endured persistent exposure to salty sea air, high humidity, heat from the trains and diesel fumes. This relentless environmental assault has resulted in significant corrosion of the structural steel canopies, causing progressive deterioration of the exposed steel. The extent of the damage has highlighted the need for a longer-lasting solution to preserve the station's structural integrity and historical value.

Harsh environmental exposure

Rail infrastructure manager Network Rail's current coatings manufacturer could not guarantee its product's effectiveness due to the harsh location. As a result, its coatings failed within just 18-months significantly short of the intended 15-year maintenance cycle. This prompted the need to find an enhanced paint system that could outperform the existing specified paint system so as to:

- Maintain structural integrity
- Preserve the station's historical features
- Reduce maintenance and repair costs.

The solution

The solution implemented was Hexigone's 'smart' corrosion inhibitor Intelli-ion AX1, chosen for its superior corrosion protection in harsh environments. Achieving C5-level corrosion resistance, AX1 effectively combats corrosion in highly aggressive environments, such as coastal areas, while delivering longer-lasting corrosion protection. Intelli-ion AX1 has also endured 1,440 hours in salt spray testing (ASTM B117), and offers enhanced adhesion and colour retention in both laboratory and live testing.

> “By enhancing surface tolerance, AXI improved adhesion by l63.l6%, resulting in increased performance.”

Methodology

To compare performance, two protection systems were applied simultaneously:

- 50% of the train station was painted with a standard system
- The remaining 50% was painted with a system enhanced with Intelli-ion.

The areas coated with the Intelli-ion AX1 enhanced primer could not be fully prepared; they could not be washed to remove surface salts because of their location and proximity to existing live electrical wiring, had poor surface preparation, and the paint company used (a large tier 1 supplier) did not guarantee its system in these areas.

Laboratory test results

Panels with both standard paint and paint enhanced with Intelli-ion AX1 were tested for 1,000 Hours Salt Spray ASTM B117 side by side. The addition of AX1 improved corrosion resistance, significantly increased adhesion levels and the bonding of the aluminium primer to the metal surface.

Real-world results

The addition of Intelli-ion AX1 significantly enhanced the 50% repainting process of the mile-long station’s surface, comprised of tool-prepared Victorian cast iron, providing increased protection and improved adhesion and cost savings.

Contractors observed the following improved application properties: “the paint applied more easily, spread more evenly, and provided more coverage.”

By enhancing surface tolerance, AX1 improved adhesion by 163.16%, resulting in increased performance. This improvement led to reduced maintenance requirements, delivering a highly efficient, cost-effective solution with enhanced long-term asset protection.

Three years after application

Intelli-ion AX1 demonstrated superior performance compared to the standard system — designed to provide 15 years of corrosion protection. ■

A new barnacle biofouling study from I-Tech

A new study has found that nearly one-fifth of a sample group of 685 vessels inspected in drydock were found to have more than 20% of their underwater hull surface covered by barnacles, and as much as one-third had more than 10% coverage.

High levels of barnacle biofouling on underwater hulls across the global shipping fleet can significantly drag down decarbonisation efforts and increase fuel costs.

The reality of the barnacle biofouling burden on the global shipping fleet has been determined with findings from extensive analysis of hull condition across a large group of ships, of varying type and age, confirming that the presence of barnacle biofouling is extremely common.

A new research study entitled 'How much could barnacles limit shipping's decarbonisation?' published by I-Tech, developers of the barnacle-repelling antifouling technology Selektope, details how over one third of vessels in a 685-sample group sailed into drydock with barnacles covering more than 10% of their hull surface.

More alarmingly, more than a fifth of vessels inspected in the sample group were found to have over 20% of their underwater hull surface covered with barnacle biofouling, whereas only 140 vessels inspected had the optimal condition of less than 0.1% barnacle biofouling.

The extensive data analysis that sits at the core of the new research study was conducted by an independent marine coatings consultancy group based on data collected from 685 vessel hull condition inspections. These were undertaken between 2015-2025 on a majority of vessel types with a range of trading activity levels.

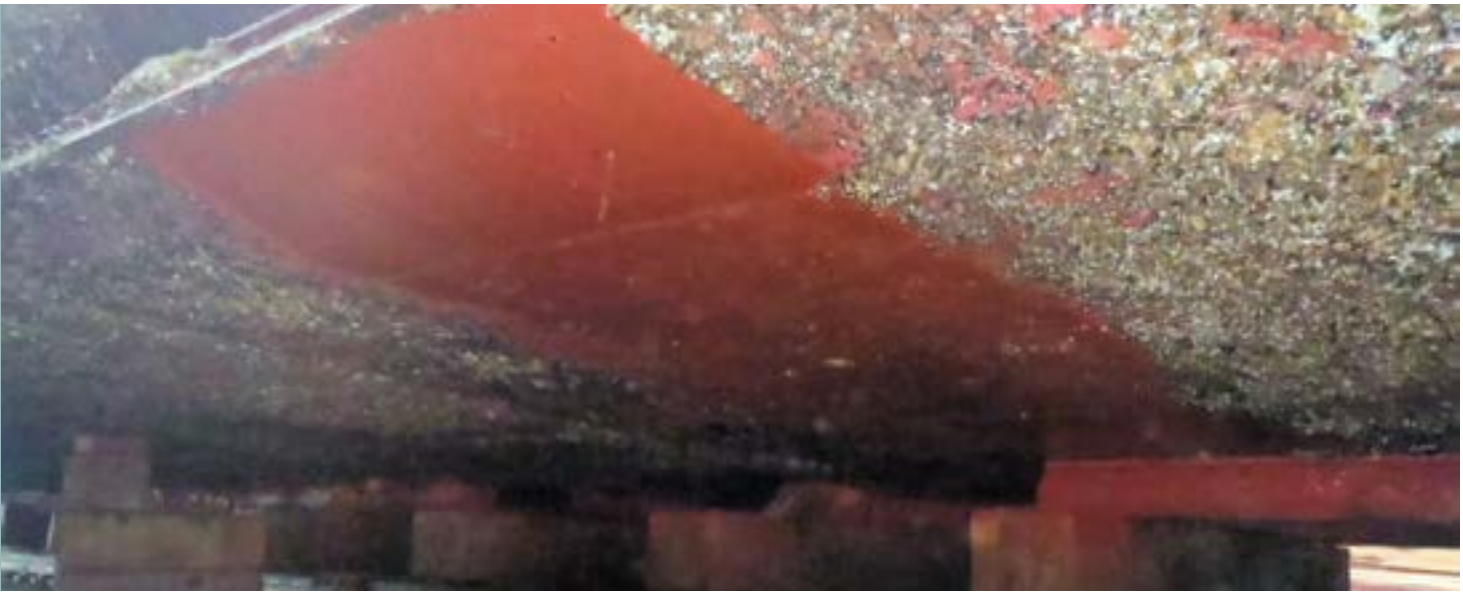
While this sample group is relatively small in comparison to the 55,000 merchant ships trading internationally, the high prevalence of barnacle biofouling found gives indicative insight that should be of great concern to the industry, considering the immense negative impact barnacle biofouling has on increasing vessel emissions.

Barnacle biofouling was found on all vessel types; however, it was present on tankers more than other ship types. For example, almost 90% of tankers were found to have barnacle biofouling present on their underwater hull with varying intensity, compared to around 70% of pure car carriers and containerships inspected.

It was also clear that lower-activity vessels are at greater risk and barnacle biofouling is more prevalent on the flat bottom area compared to vertical sides or boottop hull areas.

Various root causes

Variations in barnacle biofouling between vessel types can be attributable to a certain degree to different root causes: different paint systems, speed, activity and route. However, the presence of more than 10% barnacle biofouling coverage can result in significant added resistance, with 36% more shaft power required to maintain the same speed through water. This has a significant negative impact on a vessel's fuel use and subsequent emissions to air. Extrapolating from published data taken from a 2011 study by Michael P. Schultz, this level of hard biofouling could be responsible for at least 110 million tonnes of excess carbon emissions



per year, and an additional $15 billion spend for the global commercial fleet. The true figure is likely to be higher, as this is a conservative calculation based on today's low-sulfur fuel oil prices and only assumes a 10% coverage of hard biofouling.

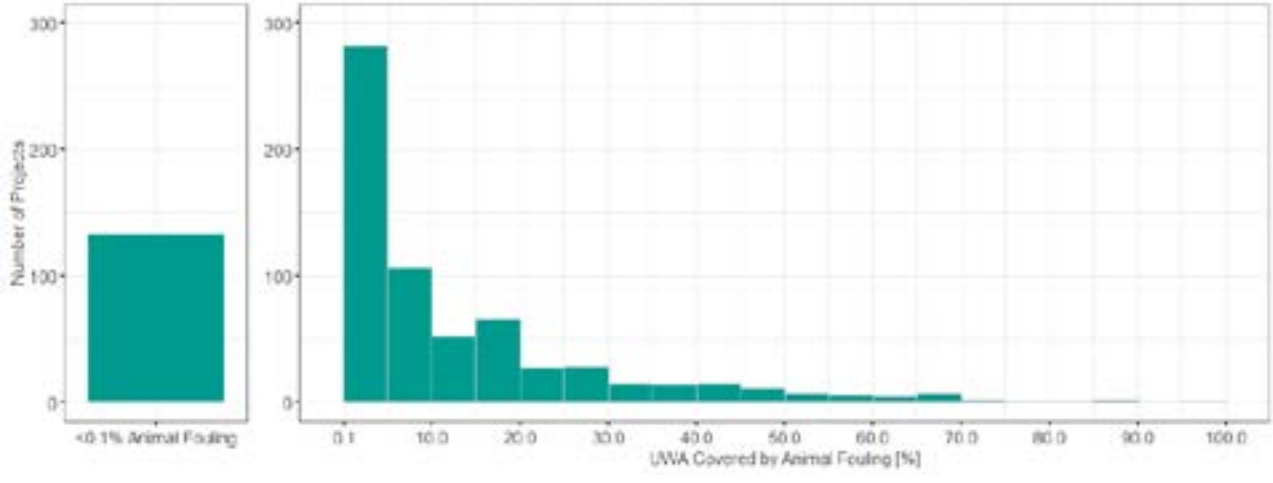
Therefore, the significant extent of hard fouling found across the sample group in the research study demonstrates the magnitude of unnecessary demand being placed on engines because of barnacle biofouling, increasing fuel consumption and emissions, and exacerbating speed losses due to increased hydrodynamic drag.

Worrying findings

"The findings that more than one fifth of vessels in this study had more than 20% barnacle biofouling is concerning," says Dr Markus Hoffmann, Technical Director at I-Tech. "This reinforces the fact that antifouling coating systems with good static performance, boosted by the presence of biocides that target hard fouling, even under extended static conditions, are an absolute necessity if barnacle fouling is to be reduced to much lower levels on a global fleet scale."

"Data analysis on a sample group of vessels using coatings containing Selektope, conducted by the independent coatings consultants, showed that in the majority no barnacle biofouling was present. This confirms that good barnacle fouling protection is always worth the investment, not least because these organisms can really drag a vessel's Carbon Intensity Indicator (CII) down and thrust greenhouse gas emissions up," he concludes.

From the conclusions drawn in the research study, I-Tech's advice for shipowners and/or operators includes using careful consideration of hard biofouling protection components during antifouling coating selection. Ensuring adequate hard biofouling protection — for all vessels, but particularly those at risk of longer idling periods while in service, is essential for the adequate protection of the global shipping fleet from barnacle biofouling. ■



Barnacle fouling surface coverage

ADVERTORIAL

RESTORING STEEL WITH A GENTLE TOUCH:

Why **Bristle Blasting** is the **Smart Choice** for the **Maritime Sector**

drs. JF (Frits) Doddema, CEO of Monti Group

MONTIPOWER
Ultimate Surface Preparation

www.montipower.com

In the world of marine maintenance, time is money – and surface preparation is everything. Whether you're a superintendent overseeing drydock schedules, a ship captain responsible for operational uptime, a corrosion engineer aiming for maximum longevity, or a maintenance engineer tasked with rust removal, you understand how critical it is to prepare steel surfaces the right way.

At Monti Group, we've spent decades pioneering a surface preparation method that is comparable to conventional 'sand' blasting: the Bristle Blaster. Today, it is the only power tool-based technology in the world that achieves visual cleanliness and an uniform anchor profile comparable to loose abrasive blasting, without the operational complexity and environmental challenges that come with loose media such as grit.

WHY SURFACE PREPARATION MATTERS

Before diving into what sets the Bristle Blaster apart, it's worth re-emphasizing a universal truth: Coating Performance is only as good as the substrate preparation. Even the highest-grade epoxy, polyurethane, or antifouling system will fail prematurely if applied over poorly prepared steel. This is particularly true in maritime applications where steel is constantly under attack – from saltwater, UV radiation, cargo residues, and changing humidity.

Traditionally, grit blasting has been seen as the gold standard for removing corrosion and old coatings. But is it always the best – or even the most practical – option? We believe the answer is often 'no'. Let me explain why.

THE PROBLEM WITH TRADITIONAL BLASTING METHODS

Loose abrasive media blasting requires infrastructure: compressors, hoses, containment systems, recovery equipment, and highly trained operators. On a drydock, that might be manageable. But when your vessel is at anchor, on a voyage, or docked in a port with environmental restrictions, grit blasting becomes a logistical headache – and sometimes entirely prohibited.

Moreover, grit blasting generates enormous volumes of waste – spent abrasive, old coatings, rust, and often contaminated dust. This not only poses environmental challenges but also raises disposal costs and can delay maintenance.

Then there's the issue of surface accessibility. Tight corners, vertical bulkheads, flange edges, ballast tanks, or container undersides aren't always accessible with large blasting equipment. Crews need a more mobile, controllable, and precise solution.

THE BRISTLE BLASTER ADVANTAGE: BLASTING WITHOUT GRIT

Our patented Bristle Blaster bridges the performance of grit blasting with the practicality of hand tools. It is the only power tool in the world that is comparable to ISO 8501-1 Sa 2½ to Sa 3 visual cleanliness and generates a surface roughness of up to 120 µm (4.7 mils) – ideal and crucial for bonding a coating and adhesives.

Here's how it works: the tool features specially hardened bristle tips that rotate at high speed and are dynamically tuned to strike the steel surface at an optimal angle. The result is simultaneous corrosion removal and micro-anchoring, all in one step – without the need for blasting media or secondary clean-up.

Let's break down the real-world benefits:

1. Mobility and Accessibility

From ballast tanks to deck edges to inside of containers, the Bristle Blaster allows your crew or maintenance contractor to access confined or vertical spaces where blasting rigs simply cannot reach. Whether you're working at sea, on deck, or in port, our compact tools operate reliably from a power outlet or pneumatic source – no compressors or containment tents needed.

2. Environmental Stewardship

As a captain or superintendent, you know how strict port regulations have become. Many jurisdictions now restrict or ban abrasive blasting unless fully enclosed systems are used. The Bristle Blaster produces no abrasive waste, no airborne media, and minimal dust, making it ideal for environmentally sensitive locations or in-transit maintenance. The bristles remain clean!

3. Lower Cost and Faster Deployment

Grit blasting setups can take hours to assemble and require multiple operators and cleanup crews. In contrast, the Bristle Blaster is plug-and-play, allowing rapid mobilisation and deployment – even during a port call or cargo turnaround. This drastically reduces labour, consumables, and downtime costs.

4. Verified Coating Compatibility

Our surface profile has been validated by leading coating manufacturers across the marine and offshore sector. We routinely test Bristle Blaster surfaces with coating partners and independent laboratories to verify pull-off adhesion, edge retention, and long-term corrosion resistance. In some cases, coatings have performed better on Bristle Blasted surfaces due to cleaner, sharper anchor patterns with fewer contaminants and therefore for a longer coating window flash-rust free in marine environments.

5. Safety and Control

Grit blasting is inherently hazardous – flying media, pressurized hoses, visibility issues, and confined space risks. The Bristle Blaster offers a controlled, operator-friendly alternative that significantly reduces noise, dust, and risk of injury. It is also safer for surrounding crew and equipment, especially on active vessels.

USE CASES FROM THE FIELD

We have seen Bristle Blaster used across all classes of vessels: bulkers, tankers, offshore platforms, ferries, and containerships. One major liner operator recently used it during a mid-voyage coating spot repair on deck fittings – saving a planned drydock intervention.

In another case, a container leasing company deployed Bristle Blasters across its global refurbishment hubs, drastically cutting abrasive consumption and enabling local teams to work without permits or special waste disposal.

CLOSING THOUGHTS: FUTURE-PROOFING YOUR MAINTENANCE STRATEGY

The maritime industry is evolving under increasing pressure: environmental regulations, tighter schedules, and aging fleets demand agile, efficient, and sustainable maintenance tools. The Bristle Blaster is not here to replace grit blasting in every case, but to give you a valuable and certified alternative – one that is cleaner, more precise, and better suited to modern marine operations.

As CEO of Monti Group, I can confidently say we're committed to solving real-world maintenance challenges for real-world people. We work with your coating suppliers, your technical managers, your shipyards, and your classification bodies to ensure every application of our technology meets the highest performance standards.

If you haven't experienced the Bristle Blaster yet, I encourage you to try it. Because in the end, what matters isn't just cleaning steel – it's preserving value, reducing downtime, and extending asset life. That's what we're here for.

SETTING NEW STANDARDS FOR CRUISE COATINGS

As the maritime industry faces mounting pressure to decarbonise, cruise operators are increasingly turning to innovative solutions that balance operational efficiency with environmental performance. *John Mangano, Senior Sales Manager at Hempel A/S,* explains how Hempaguard Ultima, Hempel's groundbreaking new two-layer coating system, is helping meet this challenge.

Hempaguard Ultima combines the tried-and-tested performance of Hempaguard X7 with Hempel's revolutionary new biocide-free silicone topcoat, Hempaguard XL, preventing growth of marine organisms while ensuring long-lasting hull protection. It offers up to 21% fuel savings, enhanced fouling resistance and verified reductions in CO_2 emissions.

Q. Why is hull performance such a key focus in the cruise industry?

A. Hull performance is a critical factor in cruise operations due to the sector's unique operational profile. Cruiseships typically operate on short, repetitive itineraries, making frequent stops in warm, tropical waters where fouling pressure is high. If not properly managed, this results in biofouling, which increases hull resistance and fuel consumption, as well as the risk of carrying invasive species between ports.

The cruise sector also faces growing pressure to reduce its environmental footprint. Efficient hull coatings contribute directly to reduced biocides and emissions by improving fuel efficiency. As such, when we talk about hull performance in cruising, we're talking about something that directly impacts both operational cost and sustainability goals.

Q. How have silicone-based coatings helped cruise operators address these challenges?

A. The cruise industry has been a pioneer in adopting silicone-based coatings, primarily because they deliver a smoother hull surface and offer exceptional fouling resistance. Given the frequent port calls and warm-water routes cruiseships typically operate on, silicone coatings help to reduce friction, maintain speed and minimise fuel consumption.

Compared with other vessel types, cruise operators embraced these technologies early on. The benefits – better fuel efficiency, fewer unplanned drydocking expenses and more reliable schedules – were immediately clear. With high passenger expectations and tight operational windows, cruise lines need hull coatings that deliver consistent, long-term performance, and silicone coatings have proved to be the best solution for that.

Q. Now that you've introduced Hempaguard Ultima, what makes it stand out from previous coatings?

A. Hempaguard Ultima takes the performance of Hempaguard X7 to the next level. One of the most significant innovations is the separation of topcoat layers, which allows us to independently optimise each layer for better performance.

This unique two-layer system combines the trusted performance of Hempaguard X7 with a new biocide-free silicone topcoat, Hempaguard XL, which offers extended fouling protection. The result is a coating system that delivers up to 21% fuel savings, 160 fouling-free idle days, a 0.9% average speed loss and 6% immediate out-of-dock performance increase.

These performance improvements help vessels stay cleaner for longer, spend more time in service and reduce fuel consumption – directly supporting both operational efficiency and sustainability.

Q. Is it safe to say that Hempaguard Ultima is as much about environmental impact as it is about operational efficiency?

A. Absolutely. Hempaguard Ultima addresses both environmental and operational goals. The improved fuel efficiency translates into reduced emissions, helping operators stay compliant with IMO regulations and achieve their ESG targets. Less fuel consumption also means lower operating costs and fees related to EU ETS – an essential factor in the cruise industry's competitive landscape.

Additionally, the extended fouling defence means longer intervals between drydockings, reducing maintenance costs and providing greater scheduling flexibility. Hempaguard Ultima aligns operational efficiency with environmental sustainability in a way that is truly synergistic.

Q. What kind of reception has Ultima received from cruise operators so far?

A. The response has been very positive. Cruise operators are increasingly looking for high-performing, sustainable coating systems and Hempaguard Ultima delivers exactly that. We've seen strong adoption on both newbuilds and retrofits, and the technology is helping operators improve fuel efficiency, reduce emissions and stay on track with their environmental commitments.

There's a clear demand for solutions that can help the industry transition to more sustainable operations without sacrificing performance, and Hempaguard Ultima is a perfect fit to meet that need. ■

The cruise sector faces growing pressure to reduce its environmental footprint

Robot invasion at Dunkirk

Following extensive and successful trials, Damen Shiprepair Dunkerque has taken delivery of five AMBPR Autonomous Mobile Blast & Paint Robots

The robots are designed for shipyard use and offer the combined benefits of increased safety, efficiency and sustainability, consistent high quality and reduced expenditure.

The robots are able to undertake complete hull restoration works with a scope spanning cleaning, blasting and painting. The different tasks are undertaken with the installation of exchangeable heads on a cherry-picker device.

The robots are able to clean a vessel's hull with high pressure washing at 400 bars, situated at the optimal distance from the hull. The system can undertake both abrasive sand blasting as well as ultra-high-pressure water sandblasting at 2,500 bars, ensuring the efficient removal of all pollutants.

Painting is performed both evenly and efficiently, with the robot able to cover 100m^2/h, resulting in reduced downtime for the vessel. The quality of the result is ensured with the ability to select the desired roughness of the blasting and paint thickness.

Added safety and reduced environmental impact

Added safety comes courtesy of the autonomous nature of the solution. The robot is operated by remote control, placing the operator at a safe distance from any hazardous pressure washing or blasting and ensuring there is no chance of paint inhalation.

The robots also make a significant contribution to sustainable operations. One way in which environmental impact is reduced is via a closed-loop water system. The water used for washing and blasting is vacuumed and cleaned, enabling 90% of it to be reused.

Additionally, the system uses considerably less paint. During a conventional painting operation, up to 50% of paint is lost as a result of overspray. The AMBPR solution is surrounded by a box that prevents any overspray from escaping into the atmosphere.

This also means that, during painting, other works can take place on the vessel simultaneously without the risk of anyone breathing in any harmful fumes, once again reducing project lead time.

Currently working on hybrid power, the robots have an eye on the future and are fully prepared to run fully electrically in the future for zero-emissions operations.

As a result of the reduction in material usage and increased project efficiency, the ultimate results of the robot system are both a boost for maritime sustainability and reduced costs for the vessel operator. ■

PAINTING IN CHALLENGING CONDITIONS

Tallink's passenger ferry Star I was in drydock in early February at Turku Repair Yard in Naantali where the vessel's hull and sides were repainted using Jotun products. The seven-day docking took place outdoors, posing challenges to the progress of the work.

Star I returned to Tallink's service after a two-year break. As part of this, significant changes were made to the vessel's exterior, including colour update and the addition of company logos.

Since the drydocking was conducted outdoors, weather conditions presented significant challenges to the work schedule. During the repainting of Star I, temperatures ranged between -4°C and +5°C, with humidity occasionally reaching nearly 80%. Although precipitation was avoided, the cold temperatures and winds from the sea made painting more difficult.

In such conditions, epoxy coatings are particularly susceptible to amine blush, which can weaken adhesion and affect the quality of the paint surface. Additionally, polyurethane coatings may lose gloss in cold temperatures. For this reason, products that can be painted at low temperatures and that enable quick overcoating were chosen for the docking.

Thorough surface preparation

Before painting, the treated areas were high-pressure washed (min. 220bar) to remove water-soluble salts and other contaminants. After washing, the damaged areas were blast cleaned to Sa 2½. In addition, edges of existing paint were feathered in order to have the best possible corrosion protection at the overlap of old and new paint.

Due to temperatures fluctuating above and below freezing, blasting dust adhered tightly to the painted surfaces and had to be removed before overcoating. During this docking, freezing conditions prevented the outer surfaces from being washed with water, so they were cleaned with cloth rags before applying the topcoat.

Five-day completion

The drydocking focused on the maintenance painting of the vessel's exterior. The products used included the epoxy primer Jotacote Universal N10, the vinyl epoxy tie coat Safeguard Universal ES, the antifouling coating SeaQuantum Classic S, and the polyurethane topcoat Hardtop XPF. Jotacote Universal N10 was used for touch-up, while the other products were applied as full coat.

Star I received a new antifouling coating on its hull and a fresh topcoat on its sides. The flat bottom, side bottom, and boottop were painted with SeaQuantum Classic S. Before antifouling, the side bottom and boottop were first treated with Jotacote Universal N10, followed by Safeguard Universal ES. The topside was painted with Jotacote Universal N10 and Hardtop XPF.

Due to the tight schedule, coatings were selected that could perform in cold conditions and be quickly overcoated. The painting work was completed in five days, after which the vessel was ready to resume service. ■

➔ Star I before repainting in its new livery

Jotun coatings were selected that could perform in cold conditions and be quickly overcoated

PROCESS VESSEL REFURBISHMENT

The process vessels used to make ice cubes in West Yorkshire, UK were exhibiting corrosion and breakdown of their coatings. This was presenting a product contamination risk and also risking degradation of valuable assets.

Corroless Eastern was asked to provide a protective coating solution that would resolve both issues. This application presented a particular challenge given that the vessels operated between -15°C and +60°C in repeated cycles.

The work also needed to be conducted with minimum dust production, given the factory environment.

The solution

During a site survey, Corroless Eastern identified that the existing coatings were poorly adhered and would require complete removal.

Prior to work commencing, the client provided scaffold access with excellent encapsulation in order to fully contain the operation and later allow the climatic control of the work area to both prevent flash rusting of the prepared steel and ensure the correct climatic conditions for protective coating application.

➔↗ The process vessels were exhibiting corrosion and breakdown of the existing coatings

The first stage of the process vessel refurbishment was to wash all surfaces to be coated to ensure that any chloride residues from chemicals used within the factory were removed.

➔ The first stage of the process vessel refurbishment was to wash all surfaces to be coated

🡸🡸 All existing coatings were removed by low-dust sponge blasting

🡸 A heavy stripe coat in a contrasting colour was applied to all angles, edges and welds

🡸🡸 Wet film thickness readings were taken throughout the process (middle) and Dry film thickness readings were taken (bottom) and recorded to ensure a minimum thickness of 800 microns had been achieved

The effectiveness of these cleaning operations was confirmed by conducting chlor tests.

All existing coatings were then removed using low-dust sponge blasting, preparing the steel to SA 2.5 as per ISO 8 501-1. This low-dust preparation technology was combined with a large 6,000 CFM dust extractor to ensure that the preparation works were as dust-free as practicably possible.

The blast standard was maintained by introducing dehumidification and heating equipment in order to reduce the relative humidity as much as possible.

Following preparation, all surfaces were vacuumed clean and the effectiveness of cleaning operations confirmed by conducting dust tape assessments to ensure optimum adhesion of the new protective coatings.

Coating application

Prior to and during protective coating application, the climatic conditions were tested and recorded to ensure conformance with the manufacturer's recommendations.

A full coat of Acothane DW was applied to ensure that the protective coatings were applied to the best possible preparation standard.

When applying protective coatings to vessels that experience significant temperature fluctuations, a very high standard of surface

preparation is required due to the additional strains that the temperature changes place on the adhesive bond of the applied protective coatings.

As per best coating practice, a heavy stripe coat in a contrasting colour was then applied by brush to all angles, edges and welds.

Stripe coating is essential to ensure a full film build in areas where coatings pull thin through surface tension, ensuring maximum protection.

Wet film thickness readings were taken throughout the protective coating application process, with a target thickness of 400µm per coat.

Following application of the second coat of Acothane DW, a DC Holiday test was undertaken to check for pinholes in the applied coatings. Once the vessels would be returned to service, any maintenance would be extremely challenging, and ensuring a pinhole-free finish was critical.

Any pinholes found were marked and touched in by brush prior to the application of the third and final coat.

Dry film thickness readings were taken and recorded, ensuring that the minimum thickness of 800µm had been achieved.

Highly durable

Corroless Eastern proposed Acothane DW for several reasons, including its solvent-free nature and approvals for drinking water, which made it suitable for the production environment. Acothane DW has been used extensively for corrosion protection within the gas distribution network for over 30 years and as per ISO 12944, and at the thickness applied would give a very high durability. ■

The completed Acothane DW coating system gives a very high durability

THE IMPORTANCE OF STANDARDS

Common standards guarantee the quality and durability of surface treatment.

Standardisation establishes mutually-agreed practices across various industries, ensuring the suitability, safety and compatibility of products, services and processes.

Standards provide clear guidelines and consistent criteria, facilitating operations for authorities, companies and consumers alike. The latest update in surface treatment standards is Finland's SFS 5873.

Importance of standardisation in surface treatment

In the surface treatment industry, standardisation has a direct impact on product performance, safety and functionality. Standards ensure that surface preparation methods, coating systems and painting processes deliver high-quality and consistent results. They also promote international trade and cooperation. Uniform criteria protect both consumers and the environment, while offering industry players an effective tool for quality control and competitiveness.

Key areas of surface treatment standards

Surface Preparation: Provides guidelines on how to prepare materials to ensure optimal adhesion and durability.

Coating Systems: Defines the composition of paint layers and their suitability for different operating conditions, such as corrosion classes.

Painting Work: Specifies the procedures and criteria necessary to achieve a high-quality final result.

Quality Control and Testing: Includes inspection and testing methods to ensure compliance with requirements.

Standardisation work at Nor-Maali Oy

At Nor-Maali Oy, responsibility for participation in standardisation groups primarily lies with the Technical Service Manager. The company actively collaborates with various standardisation organisations, such as Kemesta, the Silko steel and surface treatment working group and the PSK standardisation working group. This collaboration

ensures alignment with industry developments and requirements. It also increases awareness of upcoming standard changes and enables influence over the content of future standards.

Standard update

SFS 5873 – *Corrosion Protection of Metal Structures with Protective Coating Systems Recommended for the process and metal industries.*

SFS 5873 is a Finnish national standard focused on corrosion protection for metal structures using protective coating systems. It has been developed by the Kemesta/TR 001 working group. This standard complements and refines the main surface treatment standard, SFS-EN ISO 12944. Its primary aim is to ensure sufficient corrosion protection in various environmental conditions, particularly from the perspective of Finland's process and engineering industries. The updated standard, along with all its changes, was available for public review and comments on the SFS feedback service until May 12, 2025.

Summary

Standardisation in surface treatment enhances product quality and safety while promoting responsible and sustainable development. Nor-Maali Oy's active involvement in standardisation work ensures the company's competitiveness and readiness to meet industry challenges. ■

THE BENEFITS OF UNIFIED STANDARDS FOR INDUSTRY

Quality Assurance – products perform reliably in various conditions
Compatibility – systems and products from different companies are comparable and interoperable
Customer Satisfaction – customers receive a documented and tested end result
Export and Globalisation – standards facilitate product exports and compliance with international requirements

PRIMERS WITH PURPOSE: THE OVERLOOKED POWER IN CORROSION PROTECTION

More than a basecoat, the right primer plays a decisive role in how long a coating system can stand up to the elements.

When it comes to protecting steel structures from corrosion, the topcoat often gets the attention. It's what people see. But what lies beneath, the primer, is doing much of the heavy work.

Primers are designed to bind the coating system to the substrate – that much is widely understood. What is less discussed is how much a primer can influence the lifespan, durability and even safety of an industrial surface.

"A good primer doesn't just help paint stick – it actively fights corrosion," explains Tomi Kontunen, a corrosion protection specialist at Teknos. "It's the front line, especially in environments where failure isn't an option."

In heavy industry and infrastructure, exposure conditions vary widely: steel bridges exposed to marine air, support structures under chemical stress or machinery facing daily abrasion. Primers are rarely interchangeable. A zinc-rich epoxy that works on an offshore rig may be unsuitable in a warehouse setting, just as a waterborne primer for light indoor use may fail outdoors after a single winter.

And yet, many projects treat primers as generic.

A silent, chemical defence

Modern corrosion-protection primers ensure good adhesion of painting system to substrate. They create dense paint film, like epoxies, or contain inhibitors that slow down the chemical reactions that lead to rust. Zinc-rich primers go further, offering sacrificial cathodic protection by corroding in place of the steel beneath.

Each of these mechanisms serves a different purpose. And each is most effective only under specific conditions, defined by humidity, salinity, temperature variation and surface preparation quality.

"We've seen many cases where the primer is technically sound, but it wasn't right for the job," Kontunen noted. "That's where most failures begin, not in the topcoat, but at the base."

More than chemistry

Selecting a primer is as much about process as it is about performance. How will the steel be prepared, is it shot blasted to Sa2.5 and what is the surface roughness, is it in line with the painting system total dry film thickness? Will the application take place in a controlled facility or outdoors on site? How long until the topcoat is applied? Will welding or cutting follow?

These are questions coatings manufacturers like Teknos ask when working with customers. It's not only about product selection but about aligning materials with realities on the ground.

"Technical support is part of the system," says Kontunen. "Because paint is not installed in ideal conditions – it's installed in the real world."

What's at stake

Corrosion costs economies billions each year. It undermines infrastructure, delays production and introduces safety risks. Extending the life of a coating system by getting the primer right can reduce total maintenance costs, avoid shutdowns and preserve asset integrity.

A primer may not be visible once the job is finished. But it's doing its work, silently, for years.

> "The best coatings are systems, and every system is only as strong as its foundation."

Looking closer

Those responsible for protective coating specifications, engineers, asset owners, procurement leads, would do well to start their conversations below the surface. The best coatings are systems, and every system is only as strong as its foundation.

For those seeking technical guidance on selecting the right system from the start, Teknos provides material recommendations and system design tailored to project needs and environmental conditions. ■

More than just a statue restoration

The restoration of a religious statue in downtown Houston, Texas started with undoing previous restoration work, followed by its repainting with a finish that matched the original bronze effect. Sculpture conservators *OnAim* tell the story.

➔ OnAim Conservation used Permalac NT Bronze to repaint the stature after carrying out all the repairs

➔ The statue had been painted at least three times previously

The Sacred Heart of Jesus Blessing statue, measuring 84¨ x 42¨ (2.lm x l.lm), depicts Jesus with arms extended in a welcoming posture, one knee slightly bent. His robe is draped around his body, open around the front, revealing the sacred heart on his chest.

The statue graced the front of the old Downtown Houston Co-Cathedral of the Sacred Heart church for many years. It was one of the pieces saved to now welcome the community at the new Archbishop Fiorenza Plaza, located at the corner of St. Joseph and San Jacinto, directly across from the entrance to the Co-Cathedral of the Sacred Heart.

This statue, confirmed through material analysis to be made of zinc, was manufactured by the Daprato Statuary Company based in Chicago-New York, using its Orbronze technique. A page from Daprato's l929 trade catalogue indicates that Orbronze is a combination of superior metals, having a highly perfected copper surface, oxidised and finished in fine bronze effect.

Historical context

Zinc statues became popular in the l850s as a more affordable alternative to bronze. They were widely distributed, especially to small towns, through trade catalogues and then delivered by train. The use of the material diminished though, and by the l950s zinc statues were no longer produced. Thus these statues are historically significant, reflecting early 20th-century American life.

Despite its previous popularity, there are many downsides to the metal – especially that it is a weak and brittle material. Many of the historical statues experience cracking at the joints as they start leaning from the weight and lack of internal structure. It used to be common practice to treat these statues by filling them with concrete, which created more problems by allowing water to penetrate and further damaging the metal.

Houston's Sacred Heart of Jesus statue most likely experienced some brittleness when it suffered severe damage during a vandalism incident in l996. A pipe was used to knock off its head and hands. This caused extensive fracturing and breakage to the right hand, arm, shoulder and chest area as well as damage to the head. It became apparent that the chest area to the right of the sacred heart where the cloth drapes over was damaged so severely as to cause a total loss of metal in that section.

The previous restoration was done with a concrete fill surrounding a mild steel armature, secured in various spots with stainless steel screws/bolts, and cracks/seams filled with a putty-type epoxy. The missing sections were carved out of concrete. The statue was painted at least three times previously, with the first of these coats being copper-based in nature.

Restoration process

Paint removal and cleaning: The restoration began by stripping the paint and finish. This revealed the original bronze-like finish and the concrete inside the statue. Soldering material was softened with heat to allow parts of the statue to be taken apart.

Interior cleaning: As pieces came apart, the interior concrete, plaster and polyester filler was removed using power tools. In preparation for media blasting, all pieces of the statue were heat-washed to remove any remaining solder material.

Surface preparation: The statue pieces were blasted with fine glass beads to clean off any remaining oxidation and old repairs. This exposed the true extent of the damage – a lot of pitting had occurred where the metal was in direct contact with the concrete.

Structural reinforcement: The statue's base was attached to its granite pedestal using a sturdy stainless-steel frame and brass spacers to help with moisture evaporation. Inside, brass strips were used to reinforce the structure. In areas where soldering was not possible, a strong epoxy putty, Belzona IIII, was used to fill cracks, sometimes backed with brass screws for extra

support. Belzona is a two-part repair composite for metal repair and resurfacing based on solvent-free epoxy resin reinforced with silicon steel alloy. This repair material will not corrode and resists a wide range of chemicals.

Right shoulder reconstruction: The right shoulder, badly damaged and previously reshaped with concrete, was recast using a mould made from latex and fibreglass. This new resin piece was attached with Belzona and brass tabs, and then painted to blend in with the rest of the statue.

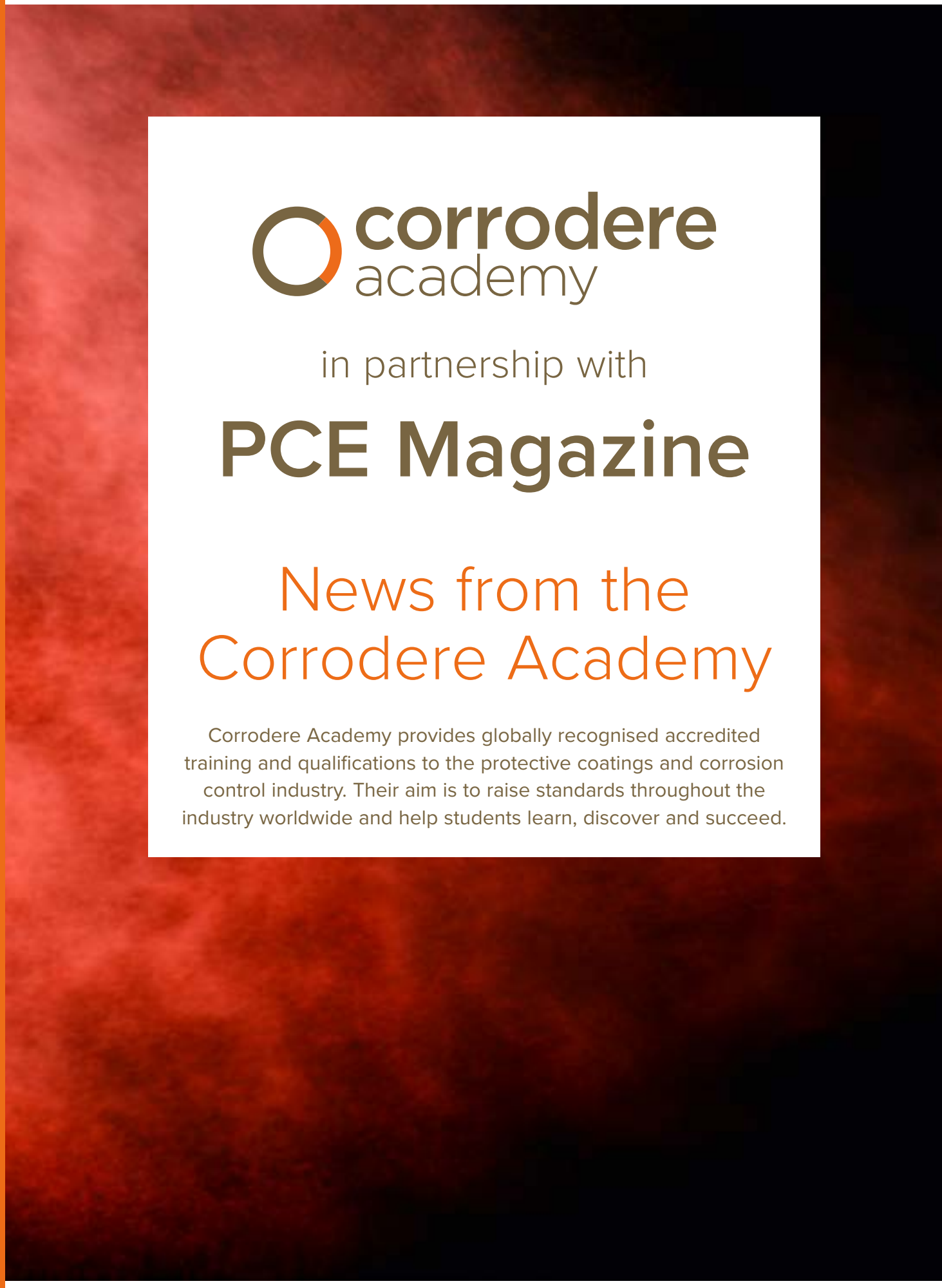
Final painting: For the final coating of the sculpture, OnAim used Permalac NT paint, which is a fast-drying, easy-to-apply acrylic lacquer coating. It is a transparent tinted, low VOC formula which lays down similar to paint. Permalac NT Bronze is highly resistant to environmental breakdown caused by UV, acid rain and salt. OnAim applied a darker bronze-coloured basecoat which was then highlighted with a lighter copper-coloured topcoat, most closely matching the original Orbronze patina. It was finished off with three coats of Permalac NT semi-gloss clear.

> “The restoration of the Sacred Heart of Jesus Blessing statue not only preserved its physical structure but also honoured its historical and cultural significance.”

Findings and historical insights

During the restoration, the number 31 was found stamped inside many metal sections, possibly indicating the edition number. This suggests the statue might be from a 1931 mould, differing slightly from a similar statue in a 1929 catalogue. Existing repairs showed the use of copper plates for filling holes, aligning with original techniques, and the added brass tabs and screws were consistent with these methods.

The restoration of the Sacred Heart of Jesus Blessing statue not only preserved its physical structure but also honoured its historical and cultural significance, ensuring it remains a cherished artefact for future generations. ■



corrodere academy

in partnership with

PCE Magazine

News from the Corrodere Academy

Corrodere Academy provides globally recognised accredited training and qualifications to the protective coatings and corrosion control industry. Their aim is to raise standards throughout the industry worldwide and help students learn, discover and succeed.

Corrodere Academy Launches PFPNet Passive Fire Protection Inspection Courses

Corrodere is proud to launch the first inspection training course to cover both epoxy and cementitious passive fire protection (PFP) coatings. Developed in partnership with PFPNet, this course sets a new standard in PFP inspection training across the hydrocarbon industry.

Available online through the Corrodere Academy, the course delivers essential knowledge to raise inspection competency and support long-term safety and compliance.

Find out more at corrodere.com.

The Critical Role of Inspectors in Passive Fire Protection for Oil, Gas, & Energy Industries

Passive fire protection (PFP) is a fundamental safety measure widely used across the oil, gas, and energy sectors. One of the most common methods for protecting structural steel is the application of spray-applied PFP coatings, which are crucial in preventing structural failure during a fire.

To advance knowledge, skills, and standards in this vital area, the industry group **PFPNet** was formed several years ago. Its membership includes major oil and gas companies, engineering design firms, fabricators, contractors, regulatory bodies, and PFP material manufacturers. PFPNet has become the leading technical authority in passive fire protection within the energy sector, producing numerous guidance documents—some of which have been adopted by the International Standards Organisation (ISO).

PFPNet benefits from a diverse group of experts who help identify critical industry challenges. Feedback from members revealed that the installation of PFP materials has often fallen short of desired standards, resulting in significant failures. This highlighted the urgent need for improved training, not only for installers but also for inspectors tasked with ensuring the quality and safety of PFP applications.

Inspectors Need Specialised Training

A common misconception is to treat spray-applied PFP coatings as simply “paint,” leading to paint inspectors being assigned to oversee their application. However, these coatings are far

more complex. They are typically made from epoxy or cementitious compounds, often requiring embedded mesh within the coating and subject to strict surface preparation, priming, and environmental conditions.

Furthermore, spray-applied PFP coatings are applied at much greater thicknesses than paint—epoxy coatings can be up to 20mm thick, while cementitious coatings may be even thicker. These materials are critical safety elements designed to protect structures, safeguard personnel evacuation, and reduce environmental risks by containing hazardous substances during a fire.

Given their importance, the inspector's role is pivotal in ensuring that PFP coatings are installed correctly. Proper training is essential for inspectors to understand the specific differences between PFP coatings and conventional paints, as well as to grasp the safety implications of their work.

A New Standard in PFP Inspector Training

In response to a jointly identified industry need for improved inspector training, **PFPNet** and **Corrodere Academy** collaborated to develop a specialised Level 2 online training course focused on the inspection of passive fire protection coatings.

The course has been **accredited by PFPNet**, ensuring it meets the highest industry standards. It is the first Level 2 qualification to fully integrate both **epoxy and cementitious fire protection coatings**, reflecting the evolving demands of the oil, gas, and energy sectors.

Delivered entirely online, the course offers flexible, accessible training for inspectors worldwide. It establishes a new benchmark for competency and quality in passive fire protection inspection, helping to drive safer installations and elevate industry standards.

The new Level 2 course is available now. To find out more or to enrol, visit corrodere.com or contact Corrodere Academy today.

Cladspray Solutions Upgrade to Affiliate Training Provider

Cladspray Solutions have upgraded from a Registered Company to an Affiliate Training Provider! This exciting development means they can now deliver Train the painter courses not only in-house for their own team but also externally to others in the industry.

Their first official training session as an Affiliate was a great success, receiving glowing five-star reviews from students. It's fantastic to see companies like Cladspray championing high standards in protective coatings training and sharing their expertise across the sector.

Atlas Coating Joins Train the painter Programme

Atlas Coating has become a registered company with the Train the painter programme, now approved to deliver the Powder Coating Application course in-house to their staff. This initiative reflects their commitment to upskilling their workforce and maintaining high industry standards. By offering this internationally recognised training internally, Atlas Coating ensures consistent quality and expertise across their operations, supporting both employee development and continued excellence in delivering projects.

We are thrilled to announce that our April Student of the Month award goes to Leigh Jones

Leigh was nominated for this by our Training Director David Eyre for his fantastic work on the Coating Supervisor course!

Leigh shared his experience and highlights with us:

"Just wanted to say a massive thank you. I really enjoyed the course and listening to David with the experience he has, I was fully engaged and loved every minute, and the best thing is I took a lot away from it, that can only help me in my own endeavours going forward!"

Thank you Leigh for your kind words and congratulations from everyone here at the Corrodere Academy!

Congratulations Leigh

from everyone at the Corrodere Academy!

JMK Training Becomes Affiliate Provider of Train the painter in Australia

Corrodere Academy is proud to announce that JMK Training has joined as an official affiliate provider of the Train the painter programme in Australia. Led by Training Director Jim Ragg, who brings over 40 years of experience in the protective coatings industry, JMK Training will deliver high-quality, internationally recognised training to professionals across the region. We're excited to welcome JMK Training to the Corrodere network and look forward to their contribution to raising industry standards.

Corrodere Academy Launches New Sustainability Module

Corrodere Academy has launched a brand-new Sustainability Module, available as an optional online add-on to all Train the painter inspection and specialist courses. This new module reinforces the Academy's commitment to promoting sustainable practices within the protective coatings industry. Designed to raise awareness of environmental impact and encourage responsible working methods, the module supports individuals and organisations striving for greener operations. By integrating sustainability into its training programmes, Corrodere Academy is helping to drive positive change across the industry and support a more environmentally conscious future in surface preparation and protective coatings.

Corrodere Academy Registered Companies and Affiliate Providers

A1 Powder Coatings Ltd	a1powdercoatings.co.uk
Access & Coating Group	access-coating.com
AIC (Advanced Industrial Coatings) Ltd	aic-ltd.net
Applewood Painting Company	applewoodpaintingco.com
Arabian Pipecoating Company Ltd (APCO)	apco-coating.com
ARS UK Ltd	arsltd.co.uk
AW Rail Services Ltd	awltd.co.uk
Barrick Pueblo Viejo JV	barrick.com
Barrier Fire Protection Ltd	barriergroup.com
BDS Industrial Painting	bdscontracts.co.uk
Bilfinger UK Limited	uk.bilfinger.com
Bradleys Metal Finishers	bradleysmetalfinishers.com
Brand Energy & Infrastructure Services	beis.com
Brook Blast Limited	brookblast.com
Buckingham Coatings	buckinghamcoatings.co.uk
Caterpillar (NI) Limited	caterpillar.com
Cladspray Solutions Ltd	cladspraysolutions.co.uk
Control de Revestimientos SL	conrevtos.com
Curtiss Wright Surface Technologies	cwst.co.uk
Dart Industrial Services Ltd	dart-is.co.uk
Denholm Industrial Services	denholm-industrial.com
Denholm Universal Ltd	universalcoatings.co.uk
DF Coatings Ltd	dfcoatings.co.uk

Corrodere Academy Registered Companies and Affiliate Providers

	DLPS - Diversified Lines Petroleum Service	dlps.sa
	Dubai Coating Ltd	dubaicoating.ae
	Duratec Limited	duratec.com.au
	EIS Infrastructure	dwdeisltd.co.uk
	Elite Blasting Solutions Ltd	eliteblastingsolutionslimited.co.uk
	Elite Coatings International Limited	elite04.co.uk
	Equans	equans.co.uk
	Enzo Corrosion Services	enzocorrosionservices.com
	Ferrous Protection Ltd	ferrousprotection.co.uk
	FI Coatings Ltd	
	Firecote Limited	sitecote.co.uk
	FMC Technologies Ltd	technipfmc.com
	Galco Steel Ltd	galco.ie
	Grand Bahama Shipyard Ltd	grandbahamashipyard.com
	Griffon Hoverwork Ltd	griffonhoverwork.com
	Hankinson Whittle Programmed Ltd	hankinsongroup.co.uk
	Harrisons Engineering Lancashire Ltd	harrisons-engineering.co.uk
	HI-Tech Surface Treatment Ltd	hi-techsurfacetreatmentltd.co.uk
	Hunter Steel	huntersteel.co.uk
	Hutchinson Engineering Ltd	hutchinsonengineering.co.uk
	Impact Coatings	impactcoatings.co.uk.
	Intergroup Ltd	intergroup.co.nz
	Jack Tighe Ltd	jacktighe.com

Corrodere Academy Registered Companies and Affiliate Providers

J&D Pierce	**J & D Pierce**	jdpierce.co.uk
K&N Finishers	**K&N Finishers (Southern) Ltd**	kandnfinishers.co.uk
KAEFER	**Kaefer Limited**	kaeferltd.co.uk
KGD	**KGD Enterprises Ltd**	kgd.co.uk
LASSARAT	**Lassarat Angola**	lassarat.com/en/group
LEDWOOD Engineering. Fabrication. Coating. Construction	**Ledwood Protective Coatings Ltd**	ledwood.co.uk
LIEBHERR	**Liebherr Container Crane Ltd**	liebherr.com
LJF COATINGS	**LJF Powder Coating LTD**	ljfcoatings.com
MALAKOFF	**Malakoff**	malakofflimited.co.uk
Metspray	**Metspray**	metspray.co.nz
Miller Fabrications	**Miller Fabrications Ltd**	millerfabrications.com
NORTHPOINT	**Northpoint td**	northpoint.ltd.uk
	NSB Infrastructure	nsb.net.nz
NUSTEEL	**Nusteel Structures Ltd**	nusteelstructures.com
oneAIM	**OneAIM**	one-aim.co.uk
PFP IRELAND PASSIVE FIRE PROTECTION	**PFP Fire Systems Ireland Ltd**	pfp-ireland.ie
POWERTHERM CONTRACT SERVICES LTD	**Powertherm Contract Services Ltd**	powertherm.co.uk
RLP	**RLP Painting Contractors Ltd**	rlp-painting.co.uk
saskarc	**Saskarc Inc**	saskarc.com
SEARAY	**Searay Services Ltd**	
Severfield	**Severfield (UK) Ltd**	severfield.com
ZPMC	**Shanghai Zhenhua Heavy Industries Co Ltd**	zpmc.com
SHIRLEY INDUSTRIAL PAINTERS & DECORATORS LTD	**Shirley Industrial Painters and decorators Ltd**	shirleyindustrialpainters.co.uk

Corrodere Academy Registered Companies and Affiliate Providers

SMS	**Shutdown Maintenance Services (SMS)**	shutdownmaintenanceservices.co.uk
SMT	**SMT Ltd (Standish Metal)**	standishmetal.co.uk
SPCL	**Solent Protective Coatings Limited**	solentpc.co.uk
SCA	**Specialist Coatings & Inspection**	specialistcoatings.net
SPG	**SPG (Specialist Painting Group) Ltd**	specialistpaintinggroup.co.uk
TAZIKER	**Taziker Industrial Ltd**	taziker.com
tecade	**Tecade S.A U**	tecade.eu
Technomechanica	**Technomechanica Ltd**	technomechanica.eu
TEMA	**Tema Protective Coatings**	temaprotectivecoatings.co.uk
THOMSON	**Thomson Protective Coatings**	thomsonprotectivecoatings.co.uk
TIS	**TIS Ltd (NGA)**	tis-ltd.com
TRINITYRAIL	**Trinity Rail Sabinas #442**	trinityrail.com
TRINITYRAIL	**Trinity Rail de Mexico**	trinityrail.com
ULA	**ULA (BG) Ltd**	ula.bg
UP	**Ultimate Protection**	up-group.uk
VIP	**V.I.P Verniciatura Industriale Pesarese Srl**	vippesaro.com
Vale	**Vale Protective Coatings**	valeprotective.co.uk
VIGRA	**Viguesa de Granallados**	vigra.es
VolkerLaser	**VolkerLaser**	volkerlaser.co.uk
W G Beaumont & Son Ltd	**W G Beaumont & Son Ltd**	wgbeaumont.co.uk
wardlepainters	**Wardle Painters Limited**	wardlepainters.co.uk
WESCOTT COATINGS	**Wescott Industrial Services**	wescottcoatings.com
HARE	**William Hare Limited**	hare.com

NEWS

FIRST DRYDOCKING FOR ELECTROSTATIC COATING

PPG has announced the first drydocking for COSCO Shipping Energy Transportation Ltd using electrostatic application of PPG Sigmaglide fouling release coating. The project was carried out on the Yuan Chun Hu, a 333m crude oil tanker owned by COSCO Shipping, at the Liuhengdao shipyard in Zhoushan, China. PPG Sigmaglide 2390 coating was applied to the underwater hull and PPG Nexeon 810 antifouling coating to the boottop.

"Shipowners and shipyards are being encouraged to look for innovative solutions in order to comply with stricter environmental regulations and meet their sustainability goals," said Xia Lei, PPG business director, Marine Asia Pacific, Protective and Marine Coatings. "Our premium hull coatings suitable for electrostatic application can help to reach these targets."

PPG Sigmaglide 2390 coating is biocide-free and helps vessels reduce power consumption by up to 20% and GHG emissions by up to 35% compared to traditional antifouling coatings. These performance benefits stem from PPG's HydroReset technology, which creates an almost friction-free, non-stick surface that marine organisms cannot recognise or adhere to. PPG Nexeon 810 coating is an ultra-low-friction antifouling that can enable a total GHG emissions reduction of up to 25%.

Both hull coatings are compatible with electrostatic coating application, introduced by PPG to the shipping industry just over a year ago. Electrically-charged paint particles are precisely guided toward the grounded surface of the vessel, resulting in exceptionally even distribution and the formation of a uniform, ultra-smooth, long-lasting film layer. This technique offers sustainability benefits including increased transfer efficiency compared to traditional airless spraying, thus significantly reduces coating overspray and waste. Combined with the low volatile organic compound (VOC) emissions of PPG Sigmaglide coating, the technique provides an improved working environment for the applicators.

50-YEAR CELEBRATION

AkzoNobel is celebrating a 50+ year partnership with CNH, one of the world's leading manufacturers of agricultural and construction equipment (ACE), and how the super-durability, performance, and colour consistency of its Interpon powder coatings are enabling CNH to compete on a world stage.

One of the very first to use powder coatings to protect its combine harvesters, balers and forage harvesters, CNH made the switch from AkzoNobel's industrial paints to its Interpon ACE powder coatings 25 years ago. The AkzoNobel team helped CNH in adapting its existing liquid line to accommodate powder, while using the same floor space and oven.

CNH was also among the first to use Interpon's low cure (Interpon ACE 2010 Low-E) powder coatings, which have helped the company to reduce its energy consumption and therefore its carbon emissions.

"We chose AkzoNobel because it has the global capability to develop the powder coatings we needed to adapt to new market demands, and the demands of our own production facility," says Frank Verhoye, who heads up Paint Central Manufacturing at CNH at its Zedelgem plant in Belgium.

To meet evolving regulatory and environmental requirements, production was transitioned to a new generation of polyester products formulated without TGIC (triglycidyl isocyanurate). This move ensured compliance with updated health and safety standards while supporting broader sustainability objectives.

The Interpon team helped in creating colours that accurately and precisely matched those required; CNH brands' products are used mostly in the summer, so having a powder coating that has a high resistance to UV light was a major advantage. They similarly have good resistance to corrosion caused by high humidity or liquid spills, such as diesel and oil.

NEW AIRCRAFT PAINTING FACILITY

Bombardier has announced the addition of a new two-bay paint facility at London Biggin Hill Airport in the UK to enhance its high-quality service offering.

With plans to open in the second half of 2026, the facility will be approximately 51,000 sq ft (4,738 sq m) and designed to accommodate all Bombardier Global, Challenger and Learjet aircraft. It will be a significant addition to the airport's infrastructure and once operational, it is estimated to generate over 50 skilled jobs, underscoring the airport's support for local job creation.

"Bombardier's sustained investment in new facilities at London Biggin Hill highlights the airport's role as a strategic hub for MRO operations," said Robert Walters, Commercial Director at the airport. "Together with Bombardier, we will continue delivering premium services to our customers, creating valuable local employment opportunities, and strengthening our contribution to the regional economy."

"The addition of the new paint facility at the London Biggin Hill Service Centre is the latest example of how we continue to expand our service offerings for our customers in order to keep their aircraft in the air – and looking good as well," said Paul Sislian, Executive Vice President, Aftermarket Service & Strategy at Bombardier. "It perfectly aligns with our objective to ensure customers consistently receive an outstanding experience throughout our service centre network, ensuring their aircraft are always at the ready for important missions."

NO-NEGATIVE-IMPACT COATING

Nippon Paint Marine has announced that results from a recent independent study show that its Aquaterras hull coating had no negative

➔ CNH was one of the very first to use powder coatings to protect its combine harvesters, balers and forage harvesters

impact on the marine life tested – including zero mortality among marine invertebrates – following simulated in-water hull cleaning.

The trial, conducted by the independent laboratory PML Applications Ltd and concluding in August 2024, exposed marine organisms in estuarine sand and mud to flakes of the Aquaterras biocide-free self-polishing coating.

Aquaterras is a low friction, biocide-free self-polishing coating that provides a long-lasting smooth hull surface for up to 90 months, and up to 14.7% fuel savings compared to market average. In-water cleaning has become a greater feature of ongoing hull maintenance, as awareness of the fuel-saving benefits of reduced friction between hull and water has increased.

ROBOT DELIVERY MILESTONE

Dürr's 19,000th painting robot will be delivered to BYD's first European plant in Szeged, Hungary. Equipped with the high-speed EcoBell3 rotary atomiser, this robot will provide BYD with exceptional paint quality while supporting sustainable production.

BYD Auto Company Ltd, a leading Chinese new energy vehicle manufacturer, is among the first Chinese car manufacturers to establish a factory in Europe. In total, Dürr has supplied more than 120 painting and handling robots to the Hungary plant, offering environmentally-friendly and efficient painting solutions for electric vehicles.

The plant's painting lines are equipped with Dürr's EcoRP series robots in both six- and seven-axis models, automating interior and exterior painting in coordination with handling robots. The seven-axis robot also assists with opening the hoods (bonnets), while the six-axis robot efficiently paints the exterior of the vehicles.

BYD has adopted Dürr's EcoBell3 high-speed rotary atomiser to ensure flawless painting quality with uniform shade, flow and layer thickness. In combination with advanced environmental and colour-changing technology,

PML Applications Ltd conducted the trial on Aquaterras

the atomiser family enables fast colour changes and reduces energy consumption.

The integration of the standardised and modular EcoSupply P special paint system from Dürr will further increase efficiency. The piggable system returns paint residue to the container, significantly reducing both paint and solvent residue.

LARGE ORDER FOR JOTUN

Jotun has entered into a commercial agreement with the world's leading owner and operator of LPG vessels, BW LPG, to optimise hull performance across 38 vessels with Jotun's Hull Performance Solutions (HPS) from 2025 through to 2028. The agreement was signed during a ceremony at Nor-Shipping, Norway.

This contract builds on the proven performance on the existing 17 BW LPG vessels of Jotun's HPS, which has since delivered significant fuel efficiency and lower emissions.

The continued partnership underscores BW LPG's confidence in Jotun's HPS and its commitment to optimising vessel efficiency.

NEW CORROSION PROTECTION SYSTEM

German container terminals are applying Steelpaint's new corrosion protection system Stelcatec to repair existing paintwork on ZPMC ship-to-shore cranes, following the Chinese manufacturer's seal of approval in 2023.

Stelcatec, the world's first low-VOC, isocyanate-free polyurethane coating system, is being used to repair damaged original coatings on ZPMC cranes operated at container terminals in Hamburg, Bremerhaven and Wilhelmshaven.

Ahrensburg-based Adamium, which is contracted to maintain the terminals' cranes, has completed work at the Wilhelmshaven terminal and will now carry out remedial coatings work to cranes at Hamburg and Bremerhaven over the next two to three years.

"When protective coatings on ship-to-shore cranes get damaged a two-component epoxy is typically used for spot repairs, but if you don't get the mixing right, the paint will blister and be ineffective in protecting against corrosion," explains Dmitry Gromilin, Chief Technical Supervisor at Steelpaint. "It's a long process and curing takes time."

A two-component epoxy application can mean weeks before an STS crane or gantry can return to normal operations. This is because drying time is heavily dependent on substrate temperatures. And if this is too low and the ambient temperature rises, the temperature difference can preclude these coatings from being applied until more favourable conditions prevail.

"Taking a ship-to-shore crane out of commission costs the terminal money, delaying container loading/unloading operations," said Steelpaint Sales Director Frank Müller. "They wanted a ZPMC-approved one-component system that would obviate mixing errors, reduce material waste, speed up the drying process and reduce the time cranes are out of service. With Stelcatec-L, the coating can be applied and cured within a working day."

The decision to select the new coating follows successful patch testing on equipment operated by one of Europe's largest container terminals and logistics groups. The success of these trials and subsequent testing by ZPMC led to the original equipment

➔ The Jotun/ BW LPG agreement being signed at Nor-Shipping

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PCE International is published quarterly by MPI Group

Peel house, Upper South View, Farnham, Surrey. GU9 7JN. UK

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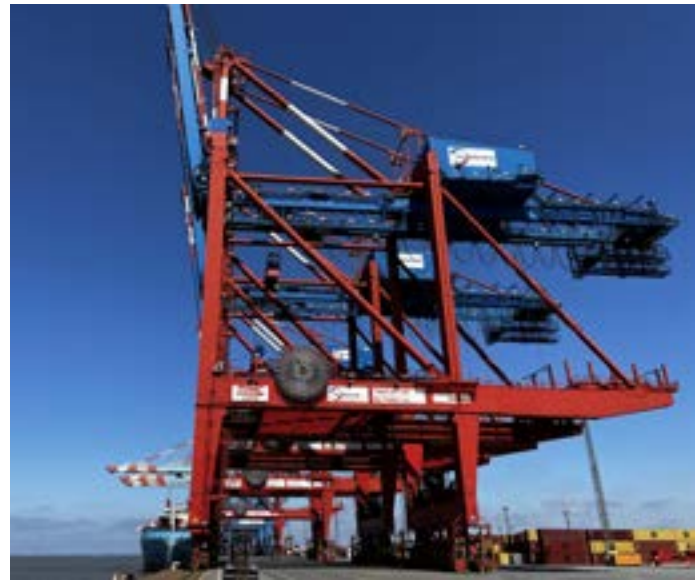

➔ German container terminals are applying Steelpaint's Stelcatec corrosion protection system

manufacturer certifying Stelcatec for use on existing and newbuild cranes.

Stelcatec is a single-pack moisture-curing paint based on a polyurethane free of isocyanates. With a very low solvent content, the new coating can be applied by brush, roller or spray in temperatures ranging from -5°C to 50°C and environments where relative humidity is as high as 98%.

Suitable for protecting steel exposed to corrosivity category C5, and meeting ISO 12944 standards for 25 years' protection, the Stelcatec range offers rapid drying times and high dry film thickness of between 80 and 120µm.

"It is ideally suited for maintenance projects where time is of the essence," explains Müller. "As Stelcatec can be applied 24/7, night-time repairs are possible, reducing the time and costs associated with touch-up work. Terminal operators no longer have to take a crane out of service for weeks on end for coatings work." ■

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