ISSUE 02 | 2025

MarketPulse

Advancements in Coatings Technology

HEATED BRIDGE DECKS:
INNOVATION THROUGH DEVELOPMENT AND COOPERATION

EV BATTERY MANUFACTURING:
MANAGING RISK FROM THE FLOOR UP

SUSTAINABILITY BY DESIGN:
EARLY CONSIDERATION OF PROTECTIVE COATINGS RESULTS IN GREENER CONSTRUCTION PROJECTS

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NEXT IS NOW

Dear readers, partners, and friends

"The best way to predict the future is to invent it."

Let me begin this issue of Market Pulse with this quote from the computing pioneer Alan Kay and introduce you to what we are currently working on.

As you read you will learn that Sherwin-Williams Protective & Marine is developing intensively in the present, making use of what has proven successful from the past and, above all, doing so with a focus on our responsibility for the future.

In our rapidly evolving landscape focusing on the future is crucial. Our success hinges on embracing innovation, adapting swiftly to changes, and delivering unparalleled solutions to you – our customers.

The importance of staying current with emerging trends and technologies is key for Sherwin-Williams to ensure that the initiatives we take today will have tangible impact on our success tomorrow.

With the second issue of Market Pulse for our EMEAI region, we want to share our knowledge with our customers. Experts from across Sherwin-Williams have joined forces to bring you valuable information on all that's happening in our industry.

In the following pages you will find articles on advances in coatings for everything from outdoor heating systems for bridges, to corrosion protection for offshore wind farms, and EV battery manufacturing plants.

We highlight the launch of new, more sustainable and innovative products, and share a host of case studies demonstrating how Sherwin-Williams is working with partners around the globe today, to future-proof public and private buildings and structures, as well as our industry at large.

I hope you enjoy this issue of Market Pulse and if you'd like to discuss anything to do with our coatings and resinous flooring solutions, we'd be very happy to hear from you.

Steffen Walz, Marketing Director - EMEAI, Sherwin-Williams Protective & Marine

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Global Industry and Technology Expertise

Our Sherwin-Williams Protective & Marine experts have spent decades in the field, working alongside customers like you.

They are here to help, no matter the industry.

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email us at **enquiries.uk@sherwin.com**
or visit **protectiveemea.sherwin-williams.com**

Claus Ackfeld
Product Manager, P&M

Zohra Ali
Segment Leader, Infrastructure - EMEAI

Admir Avdovic
Product Manager, Flooring

Joao Azevedo
Segment Leader, Energy - EMEAI

Cesar Hernandez
Demand Creation Energy Lead

Richard Kay
Segment Leader, Manufacturing and Processing - EMEAI

Sebastian Mels
Key Account Manager, Fire

Malcolm Morris
Technical Manager

Rick Perkins
Global Technical Manager, Fire

Joachim Pflugfelder
Demand Creation Infrastructure - DACH

Neil Wilds
Global Product Director, CUI / Testing

Renato Rosolen
Regional Sales Manager

Heated bridge decks: Innovation through development and cooperation

By Joachim Pflugfelder, Demand Creation Infrastructure - DACH, at Sherwin-Williams Protective & Marine Coatings, and Mario Wettengel, Bauschutz GmbH & CO. KG, Asperg, Deutschland.

Bridge builders often look for alternatives to using road salt in winter, due to its cost and the consequences for the environment, its modes of transport, and structures.

Multi-storey car park ramp surface heating systems, in combination with reactive resin-bonded thin coverings, offer a practical open-air heating system solution, mainly for use on steel and reinforced concrete bridges. Although a detailed life cycle assessment of heated bridge decks is pending, there are many arguments in favour of their use. They utilise renewable energy, and can contribute to the longer service life and year-round unrestricted safety of bridges.

Reactive resin bonded thin decks (RHD) are preferably used on movable bridges (e.g. bascule bridges), fixed bridge equipment, pedestrian bridges and ancillary areas of bridges made of steel. For instance, in Germany only RHD surfaces that have been tested in accordance with TL RHD-ST may be used. They each consist of a primer layer of reactive resins (polyurethane, epoxy resin/polyurethane or polymethyl methacrylate resin) with anti-corrosion pigments and a single or double layer topcoat of reactive resins and aggregates. The top layer is sprinkled with quartz sand, chrome ore slag or corundum to ensure adhesion of the second layer, and to achieve surface properties such as grip and wear resistance. A pavement thickness of 4 to 6mm is specified for service walkways, footpaths and cycle paths, and 6 to 10mm for surfaces subject to traffic.

Advantages of RHD coatings

Professional and correctly constructed RHD pavements can achieve a service life of more than 20 years without repair work. The use of chrome ore slag and corundum as aggregate and scattering can further extend this service life.

With a maximum thickness of 10mm, a RHD surface can save weight compared to asphalt with a standard thickness of up to 2 x 35mm. Asphalt also flows and deforms at high temperatures. These two factors are particularly important for bascule bridges. The flatter pavement structure and the lower load also allow for more creative and architecturally sophisticated structures. RHD coverings can be finished in colour using coloured bedding or head sealing, which is particularly important for footpath and cycle path bridges. In addition, an appropriate colour scheme has a positive effect on the urban climate in summer because, compared to asphalt, more solar radiation is reflected, and the surface therefore heats up less.

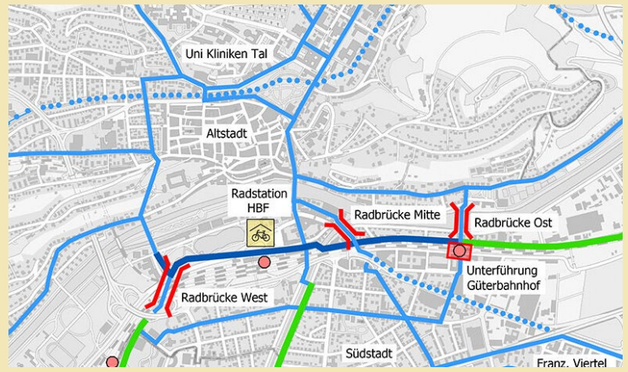
The leap forward in innovation

The planning for the footpath and cycle path bridge in Marquartstein envisaged a reaction resin bonded thin pavement (RHD pavement) on steel. A special requirement was to keep the bridge free of snow and ice even in the winter months, and thus accessible, and passable, all year round without the risk of slipping. They contacted the company STL Heizsysteme GmbH, based in Dresden, Germany, which had already developed various open-space heating systems in the STELO series. The STELO system has been used in multi-storey car park ramps for several years in combination with the special coating solutions from Sherwin-Williams (previously Sika). The robust Elastomastic™ TF wear layer, which is also used in steel construction, was used for this surface heating system. This gave rise to the idea of using the STELO system in a modified form for the first time on a steel bridge structure. STL Heizsysteme GmbH then developed the 1mm thick, heavy-duty, flat heating elements, which can be produced in various shapes and with different performance parameters. Together with specially developed control and regulation technology, a new surface heating system was created based on a tested thin covering which went into operation for the first time in the Marquartstein pilot project in 2012.

Advantages of open-air heating systems for bridges

In addition to damage to vegetation due to use of road salt, high salt levels can impair the stability of the soil structure (siltation) and damage soil organisms. Road salt causes corrosion and steel loss on vehicles and structures, which leads to considerable renovation costs and an overall reduction in their service life. There are also costs for the road salt itself and its application. Open-air heating is an alternative for bridges. It enables automatically controlled and unrestricted safety of use without the need for personnel. Frost damage to the subsoil of the structures and damage to the surface caused by the use of sand or grit are avoided. Of course, the ecological balance must also be assessed here. The use of electricity from renewable energies and geothermal energy has a favourable impact on the project.

The RHD surface of the heated pedestrian and cycle bridge in Marquartstein is completely intact even after a service life of 12 years.



RHD system design of open-space heating systems with heating elements

For a heated RHD coating on a steel bridge deck the following processing steps have proven successful for the systems of the manufacturers STL Heizsysteme GmbH and Sherwin-Williams: The steel surface is first prepared by blasting to the standard preparation level Sa 2½ in accordance with ISO 12944-4. The stripe coating Macropoxy® HM Primer Plus is then applied by single-leg airless spraying or by brushing and rolling. The Elastomastic TFN intermediate coating, an epoxy-polyurethane hybrid liquid plastic, is then applied in a system thickness of at least 4mm. After the specified drying time depending on the temperature, the two-component polyurethane-based STELObond adhesive is applied and the heavy-duty, 1mm-thick STELOpreg heating elements are bonded to it. The sensors are then installed with a sealing sleeve, the electrical connections are made and the gaps are filled. Finally, the Elastomastic TFN insulation topcoat is applied with a system thickness of at least 2mm and sprinkled with chrome ore slag, corundum or quartz sand. In Germany the STELO heating system has passed the continuous swelling bending test in accordance with TL-RHD-ST. This is the most important test that the RHD coating has to undergo, alongside twenty three other tests.

Reference examples

As part of the collaboration between the two partner companies for open-air heating and construction chemicals, six heated bridges with RHD coverings and a total area of 2,007m² have been completed. Most recently is the cycle path concept with its heated bridges in the city of Tübingen - this is described over page.

Top left
Road salt doubles the corrosion rate of steel.

Top centre
The STELOpreg heating elements are fully bonded to the RHD intermediate coating. They are a further development of the tried and tested system for multi-storey car parks.

Top right
RHD system structure of an open-space heating system with heating elements: Steel bridge panel, primer coat Macropoxy HM Primer Plus and intermediate coat Elastomastic TFN, STELOpreg heating elements, top coat Elastomastic TFN sprinkled with quartz sand (from bottom to top).

Tübingen pedestrian and cycle bridge

The city of Tübingen is currently setting new standards in the realisation of its environmentally friendly mobility concept with four heated, 4m wide footpath and cycle path bridges, financed with federal and state funds.

The West, Centre and East cycle bridges close important connection gaps for cyclists, overcoming previous barriers such as the Neckar and Steinlach rivers, and the railway tracks, while also creating a new north-south cycle link. The 1½ km long ‘Blue Belt’ is a central priority cycle route from east to west, linking the bridges to each other and the planned local, high-speed, cycle connections.

The western cycle bridge, including the ramps, is around 378m long. At its highest point, it is 11m high. Construction of the bridge began in April 2022 with completion scheduled for October 2024. For cost reasons, it is made of steel. The RHD surfacing and the integrated surface heating were produced using the same systems as the pedestrian and cycle bridge in Marquartstein. Eight heating elements are connected to each of the 82 heating circuits in the west wheel bridge. To ensure the heating elements could be installed across the entire surface of the curved bridge panel, each had to be customised with an individual geometry. To continue the Blue Belt design, the optional Acrolon® EG-5 acrylic polyurethane head sealant in RAL 5015 blue was then applied.

If there is a risk of frost and corresponding humidity, the sensors react and start the heating process. As soon as the humidity sensors signal dryness—even at sub-zero temperatures—the heating switches off automatically. This means that neither black ice nor thawing snow can form on the bridge.

Top left
STELOpreg heating element with electrical connection.

Top centre
Overview of the four cycle bridges in the cycle path network. The Blue Belt is shown in dark blue. (Image: ©University City of Tübingen)

Top right
The western cycle bridge in Tübingen with the acrylic polyurethane head sealant in the blue colour RAL 5015.

The STELO system on the steel bridge has other advantages in addition to the safety aspect. With a total power requirement of 228kW, this solution is extremely energy-efficient, as the control system only reacts to the reference temperatures from the road surface and the heating only switches on when additional moisture is present. According to Mayor Boris Palmer, defrosting therefore hardly costs any electricity, 70% of which comes from renewable energies in Tübingen. By heating the bridge instead of using road salt, the city council expect it to have a significantly longer service life, up to 50%, with acceptable installation and maintenance costs. According to the mayor, the heated cycle bridges in Tübingen cool down the city - the reason lies in the blue road surface. The manufacturer, who was involved in the central and eastern wheel bridges, states that a traditional black asphalt surface only reflects 10% of the sun’s rays. The remaining 90% is converted into heat and thus heats the surfaces and the environment. On a warm summer’s day, this can be up to 900W/m². According to the manufacturer, measurements in Tübingen showed a surface temperature of 52.5°C on the normal road. The blue colour, on the other hand, reflected 31% of the sun’s rays and the surface temperature was 38.2°C.

Sherwin-Williams simplifies offshore maintenance and repair work with Repacor SW-1000

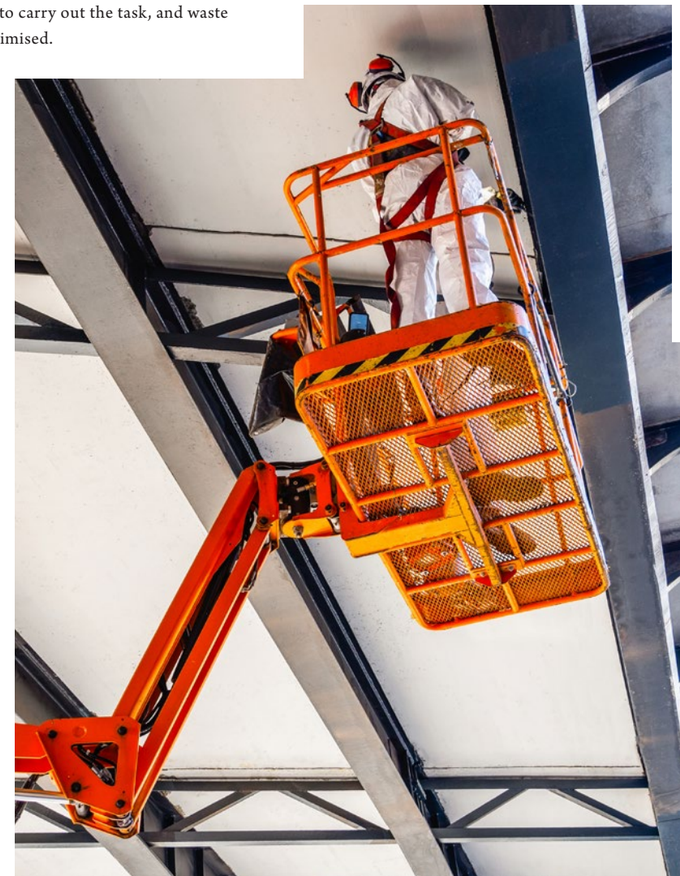
By **Claus Ackfeld,** Product Manager, P&M, **Joao Azevedo,** Segment Leader, Energy - EMEAI, and **Neil Wilds,** Global Product Director, CUI / Testing, at Sherwin-Williams Protective & Marine.

Repacor™ SW-1000 is a revolutionary 100% volume solids coating designed for safe, quick, and cost-effective maintenance or repair of steel structures.

The result of a three-year research project to develop a coating solution that would simplify maintenance and repair work on offshore wind steel structures, this innovative new product was developed with the safety of the applicator in mind. “It was designed to make potentially dangerous high-level rope access coating applications easier,” explains Claus Ackfeld, Product Manager at Sherwin-Williams. “Compared to the two to three layers needed with traditional technologies, it requires only a single layer coating, dispensed easily using a simple application gun, without the need for mixing.”

Traditional coating systems require multiple coats of anti-corrosive coatings and durable topcoats, whereas Repacor SW-1000 has all these properties built into a single coat of 500µm dry film thickness. Despite the single coat, it is expected to mimic the original performance of offshore wind structure coating systems, which are typically applied in paint shops under controlled conditions.

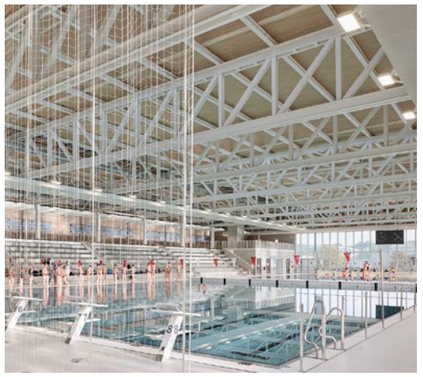
Repacor SW-1000 also boasts a cure time that is around four hours faster than alternative aerosol systems. The unique cartridge application process means the applicator can effectively work from a backpack, so only needs to make one journey to carry out the task, and waste packaging is also minimised.



Compliant with NORSOK M-501, the offshore industry standard for selecting coating materials, surface preparation, application procedures and inspection for protective coatings, Repacor SW-1000 meets the highest standards in anti-corrosion protection. Only the most effective regime can result in longer periods between maintenance and, as a result, reduce costs.

Sherwin-Williams is leading the drive towards eliminating Volatile Organic Compounds (VOCs) in paints and coatings, while being mindful of the needs of the paint applicators to be able to use products with minimal complexity and time spent on the asset. Repacor SW-1000 is entirely VOC free, as well as being free of Carcinogenic, Mutagenic and Reprotoxic (CMR) substances and 100% volume solid.

“Repacor SW-1000 is transforming the maintenance and repair of wind turbines,” says Neil Wilds, Global Product Director at Sherwin-Williams. “However, although it is used predominantly offshore, it is also an excellent solution for onshore industrial environments if a simple to apply, high performance, durable and cost-effective coating is required. The fact that a single coat gives the same anti-corrosion and durability performance as a two or three coat aerosol system makes Repacor SW-1000 a genuine game changer.”



All images ©Stuttgarter Bäder

Professional fire and corrosion protection for the roof structure of the NeckarPark sports pool in Stuttgart

By **Sebastian Mels**, Key Account Manager – Fire, at Sherwin-Williams Protective & Marine.

The development of NeckarPark has transformed Stuttgart's Bad Cannstatt district into a modern urban neighbourhood. A new sports pool, located within NeckarPark, primarily serves local schools, clubs, and competitive athletes. It features a 50 x 21m sports pool with eight swimming lanes, as well as a 25 x 12.5m vario pool with a diving facility.

The steel beams and supports of the sports pool's eye-catching roof structure were given a two-component epoxy fire protection coating by Sherwin-Williams Coatings Deutschland GmbH. FIRETEX® Platinum technology is especially well-suited for swimming pool facilities due to its exceptional resistance to damp and wet environments, effectively combining both fire protection and corrosion resistance.

Ideal fire protection product for swimming pool facilities

The products used in swimming pool facilities must fulfil specific requirements due to the high temperature and humidity levels in these environments. This includes the fire protection coating of the steel beams and supports of the eye-catching roof construction of the NeckarPark sports pool. Große-Ophoff Korrosionsschutz GmbH, based in Marl, was responsible for applying the necessary coatings. Together with the steel manufacturer, they chose tried and tested Sherwin-Williams products. Max Große-Ophoff, the managing director, explains, "There is a high-level of chloride in a swimming pool. FIRETEX Platinum was the only option for us. The system combines fire and corrosion protection, and enables a visually homogeneous surface, which was important as the steel structure is partially visible."

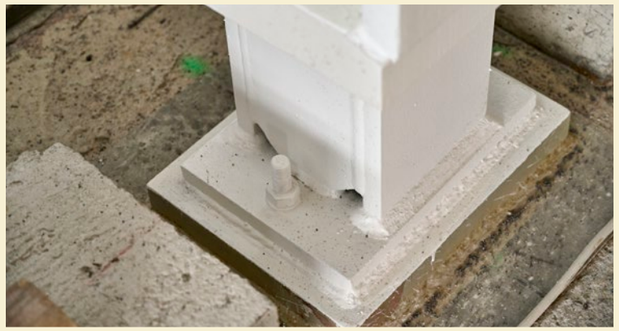
Above left
Opened in 2022, the NeckarBad sports pool is available to athletes, schools and the public.

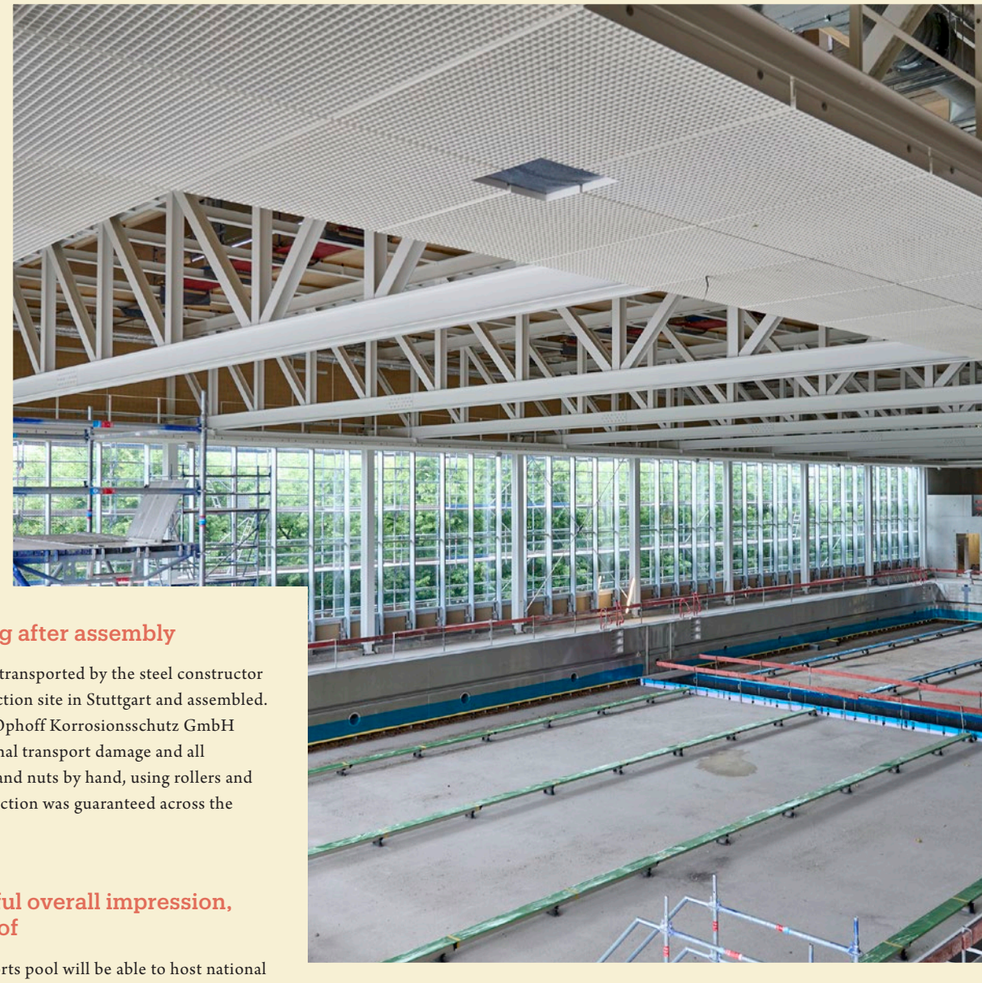
Above right
Professional competitions can be held in the new sports pool. The grandstand can accommodate up to 900 water sports fans.

Three coats applied with airless spray

The steel beams and columns were coated in the Marl factory on the Lenkerbeck industrial site. It has a continuous blasting system, with eight turbines that can process pieces of up to 20 tons in weight, 4m in width, and 28m in length. Macropoxy® 2706 EG, a two-component epoxy resin coating containing micaceous iron oxide with high mechanical resistance, was used as a primer. The solvent-free 2-component fire protection coating, FIRETEX Platinum was applied on top. The system structure offers high performance and durability, fire protection up to R90, and corrosion protection up to corrosivity class C5 in accordance with DIN EN ISO 12944. When exposed to heat, the coating forms a thermally insulating layer and thus increases the fire resistance of the steel columns and beams. Finally, an acrylic polyurethane top coat Acrolon® 2330 was applied. All layers were applied with a two-component airless system, covering a total area of 9,000m².

FIRETEX® Platinum technology has exceptional resistance to damp and wet environments, effectively combining both fire protection and corrosion resistance.





Above
The steel beams and supports of the roof structure were coated with FIRETEX Platinum technology.

Above right
To ensure fire protection across the entire steel structure, all fasteners such as bolts, nuts etc. were re-coated by hand.

Right
As the steel structure of the roof is partially visible, a visually homogeneous surface was important. This was achieved using FIRETEX Platinum technology.

Manual reworking after assembly

The coated material was transported by the steel constructor on lorries to the construction site in Stuttgart and assembled. Specialists from Große-Ophoff Korrosionsschutz GmbH then re-coated any minimal transport damage and all fasteners such as screws and nuts by hand, using rollers and brushes so that fire protection was guaranteed across the entire steel structure.

Visually successful overall impression, right up to the roof

The new NeckarPark sports pool will be able to host national title competitions. A two-metre movable wall in the 50m pool can be used to divide it in two lengthways. The water depth in the Vario pool can be adjusted, from a few centimetres for swimming beginners to several metres for diving, using a three-metre movable floor. Since the opening, the grandstand has accommodated around nine hundred water sports fans. The steel girders and supports of the roof structure, coated with Sherwin-Williams products, contribute to the extremely successful overall visual impression.

Sportbad NeckarPark	
Client:	Bäderbetriebe Stuttgart
Execution of coating work:	June - August 2022
Fire protection coating applicator:	Große-Ophoff Korrosionsschutz GmbH, Marl
Manufacturer of coating systems:	Sherwin-Williams Coatings Deutschland GmbH
Products:	Macropoxy 2706 EG, FIRETEX Platinum, Acrolon 2330

Sherwin-Williams develops innovative new packaging to reduce waste

By Admir Avdovic, Product Manager, Flooring – EMEAI

Tackling the climate crisis means that Environmental, Social and Governance (ESG) needs to be taken seriously in order to create positive change. At Sherwin-Williams one way that we are tackling the problem head-on is by considering the packaging of our products and, with this in mind, we have developed innovative new packaging for our FasTop® polyurethane cement.

Over recent years there has been a massive shift in attitude towards addressing the detrimental effects our activities continue to have on the planet. The United Nations Climate Change Conference (COP28) recognised that global greenhouse gas emissions need to be cut by 43% by 2030, compared to 2019 levels, to limit global warming to 1½°C*. To achieve this target, all sectors of the economy must act now to reduce energy use, limit production of greenhouse gases, and decarbonise wherever and whenever possible.

The FasTop range provides chemical and slip-resistant flooring solutions that are extremely hard-wearing. It is designed for use in harsh and heavy usage environments such as food and beverage plants, breweries, commercial kitchens, dairies, and manufacturing facilities with extreme temperatures, high volumes of human and heavy wheeled traffic, and rigorous cleaning regimes.

FasTop is manufactured using plant-based materials, including castor oil in the resin base, for example. Sherwin-Williams is also leading the drive towards reducing Volatile Organic Compounds (VOCs) in its paints and coatings. FasTop has a very low VOC content of <50 g/L, as attested by Eurofins, has been tested for taint by Campden BRI, and is accredited by HACCP International for specific use in food and beverage environments.

What you might not realise, however, is that Sherwin-Williams has looked at the bigger picture with FasTop. It has introduced an innovative packaging solution that reduces the weight and volume of packaging, providing its customers with potential savings in transportation and disposal costs as a result.

So how has this been achieved?

The answer is by replacing conventional buckets with ultra-lightweight flexible pouches, which contain the resin base, the hardener and the colour concentrate components. This pouch-based packaging has less than one-fifth of the weight of plastic buckets and, as a result, more product can now be delivered on each pallet. Furthermore, the empty pouches take up 40 times less storage space compared to used buckets, producing potential transportation and waste disposal savings.

FeRFA Environmental Initiative Award

WINNER

To give a real-life example, let's compare the packaging and transportation of 1,800kg of FasTop polyurethane cement, compared to an alternative bucket-based product. FasTop can be delivered on five pallets rather than eight, while the pouches create 47kg of packaging waste, compared to 240kg with the bucket based equivalent. An empty pouch also weighs just 24g, compared to a bucket's 150g, and pouches also mean less residual waste – an estimated 15g compared to 50g.

Building owners and managers are frequently seeking compliance to sustainability certification systems and one of the best known is the Building Research Establishment Environmental Assessment Method (BREEAM). Individual products can contribute towards the credits needed to obtain this certification and FasTop has achieved compliance with BREEAM's criteria for VOC emissions and content.

FasTop has all angles covered – from its modular application that means the perfect thickness can be assured every time, to its ease of application and enhanced flow and levelling capabilities.

*UN Climate Change. (2023). New Analysis of National Climate Plans: Insufficient Progress Made, COP28 Must Set Stage for Immediate Action. Available at: https://unfccc.int/news/new-analysis-of-national-climate-plans-insufficient-progress-made-cop28-must-set-stage-for-immediate

New corrosion protection for railway bridges in Switzerland

By **Renato Rosolen**, Regional Sales Manager, at Sherwin-Williams Protective & Marine.

Sherwin-Williams' tried and tested corrosion protection coating systems, in combination with professional application, makes the extension of the maximum protection period in accordance with DIN EN ISO 12944 easier. The Swiss Federal Railways (SBB) is convinced of this, as the current renovation of the Reuss bridge in Mellingen and the Fislisbach viaduct in Mellingen demonstrates.

The Heitersberg railway line is part of the important east-west connection for trains between Zurich and Bern. SBB have carried out various maintenance projects on its bridges and track, to ensure rail traffic remains safe and punctual. The extensive work has included repairs to the Reuss bridge, in Mellingen, and the Fislisbach viaduct, in Mellingen.

While the anti-corrosion coating on both bridges was showing its age, the steel did not yet show any signs of corrosion damage. However, as the bridges had to be structurally reinforced, additional abutment anchors installed, and bridge railings and expansion joints replaced, the coating on both structures was also renewed at the same time. Marty Korrosionsschutz AG from Jona was commissioned to complete this work. The company has many years of experience and extensive expertise in corrosion protection for steel bridges.

Approval in accordance with Sheet 87 is also a quality criterion for SBB

A class 1 enclosure was required in order to fulfil the strict environmental and water protection requirements, as well as the Clean Air Ordinance. The work was carried out in an airtight and dustproof environment with negative pressure and a 99% retention rate for emissions, as the old coatings contained PCBs, zinc and lead. These were removed by sandblasting, resulting in a surface preparation grade of Sa 2½. This was followed by the application of the Sherwin-Williams corrosion protection coating system, approved in accordance with TL KOR-Stahlbauten, Sheet 87, which has been tried and tested in practice for more than 20 years.

First, the 2-component, low-solvent, zinc phosphate-containing epoxy primer Macropoxy® EG Phosphate N was applied to the edges and joints using a brush and roller, and the entire surface was then sprayed airless to achieve a dry film thickness of 320µm.

The sandblasting work and the subsequent stripe coating were carried out in 15 stages per bridge within one week. This was followed by the first and second intermediate coats with the 2-component, low-solvent epoxy coating Macropoxy EG-1 Plus, containing micaceous iron oxide. Again, initial application was carried out with a brush and roller on the edges and joints, followed by the airless spraying of the entire surface to a dry film thickness of 320µm.

Above left
The Mellingen Reuss Bridge was completed in 1877 and has been upgraded several times over the years. Now the corrosion protection has also been renewed with a coating system from Sherwin-Williams approved to Sheet 87.

Above
The Fislisbach viaduct has been in operation since 1975. It has now been protected against corrosion for decades to come by Marty Korrosionsschutz AG on behalf of SBB using a coating system from Sherwin-Williams.

The new steel components for the structural reinforcement of the two bridges were given a primer coating and the first intermediate coating at the factory, and the weld seams were then also coated on site. Finally, the applicator applied the two-component acrylic polyurethane topcoat Acrolon® EG-4 containing micaceous iron oxide in the colour DB 703 (dark grey) using airless spray.

Control areas were created as an additional construction monitoring measure.

Familiar coating systems facilitate efficient processing

"We have been working for SBB for over 30 years and have coated dozens of their structures with corrosion protection. The products and systems from Sherwin-Williams have proven themselves in this regard," explains Urban Müller, managing director of Marty Korrosionsschutz AG. "We have found that the systems from Sherwin-Williams are always absolutely reliable. Our employees are familiar with them, which enables us to work efficiently," he adds.

The new anti-corrosion coating not only enhances the appearance of the two railway bridges on the Heitersberg line, but also ensures their operability and safety for decades to come. SBB's specification was the highest protection duration 'very high' in accordance with DIN EN ISO 12944, i.e. over 25 years. Long-term experience shows that high-quality, professionally applied corrosion protection systems such as those from Sherwin-Williams can provide protection for more than 30 years.

Heitersberg East railway bridges	
Client:	Schweizerische Bundesbahnen AG
Corrosion protection:	Marty Korrosionsschutz AG, 8645 Jona
Manufacturer of coating systems:	Sherwin-Williams Coatings Deutschland GmbH, 71665 Vaihingen/Enz
Execution of coating work:	Reuss bridge Mellingen: August 2023 – February 2024 Fislisbach viaduct: Execution March 2024 – September 2024
Coated surface:	11,000m²
Products and quantities:	Macropoxy EG Phosphate N (3.5 tonnes), Macropoxy EG-1 Plus (7 tonnes), Acrolon EG-4 (3 tonnes)

Above
The enclosure of the Fislisbach viaduct contained 99% of emissions and thus met the highest environmental standards.

Bottom right
The modern corrosion coating systems from Sherwin-Williams allow reduced heating of the enclosure in winter, thus saving energy costs.

Sherwin-Williams is continuously developing their own tried-and-tested products

"The protection and repair of traffic routes and infrastructure is one of our core lines of expertise," explains Renato Rosolen, DIN-certified coating inspector at Sherwin-Williams, who supervised the renovation of the two railway bridges. "DIN EN ISO 12944 regulates the corrosion protection of steel structures using coating systems. Many other standards, regulations and directives refer to this. Therefore, it can be described as a basic standard that has also proven very effective in practice. It is therefore no coincidence that SBB's execution and quality regulations AQV also refer to DIN EN ISO 12944."

Sherwin-Williams is continuously developing their own tried and tested products in order to provide modern corrosion protection, and provides coatings in accordance with Sheet 87 and in fast-curing versions approved in accordance with Sheet 97. This allows the heating output required in the enclosure in winter to be reduced by 5°C compared to the Blatt 87 systems. In this way, energy costs can be saved without compromising on quality.

All images © Source: Marty Korrosionsschutz AG

EV battery manufacturing: Managing risk from the floor up

By **Cesar Hernandez**, Demand Creation Energy Lead, and **Richard Kay**, Segment Leader, Manufacturing and Processing - EMEAI, at Sherwin-Williams Protective and Marine.

As the world transitions to electric vehicles (EV), we are witnessing the birth of a whole new industry, complete with its own unique challenges and solutions.

EV battery plants are just one part of this evolution. And with no well-established blueprint for construction, manufacturers have, to date, had little evidence-based guidance. Now, new data on the effectiveness of industrial coatings in mitigating risks such as N-Methyl-2-pyrrolidone (NMP) erosion and carbon black contamination, are helping to plug the gap, aiding the right first-time development of facilities.

Above left
Foil coating machine.

Above right
Resutile™ SDS installed in a battery manufacturing cleanroom.

Cutting edge manufacturing, cutting edge challenges

With global investment in electrical machinery construction, including EV battery plants, hitting £28.3 (€34) billion in 2023,[1] this emerging sector represents a huge growth opportunity.

As an industry, however, it is still in its infancy. As such, manufacturers are tasked with building the protocols they need to guide the safe, effective, and sustainable development of their facilities from the ground up.

These processes need to account for the unique challenges of EV battery production. The risk of NMP erosion and carbon black disposition, for example, mean standard epoxy resin floors, widely used in the construction industry when corrosive agents are involved in the manufacturing process, may not be the best solution. In addition, the increased fire risk associated with EV battery production also requires careful consideration.

NMP erosion

In lithium-ion battery manufacturing, NMP is used as a solvent in carbon anode and lithium cobalt oxide cathode binder resins, as well as a coating and gel-polymer for separators and electrolytes.

Most coating suppliers have tested their products ability to withstand uncovered NMP, which typically evaporates within several hours. Sherwin-Williams' ASTM D1308-standard evaluation, however, found that when the solvent is covered by foil or plastic, exposure can result in deterioration of standard epoxy flooring coating and leaching into the concrete substrate within two hours. Over time, this will prematurely breakdown the flooring, with particular weak points being the joint between stainless steel plate and concrete and resinous flooring systems, underneath drums or pallets, and around hosing or pipes that may 'leak' between uses.

The health and safety implications of this reaction are obvious. It poses the risk of slips and trips and obstructs the effective cleaning of facilities.

A modified urethane coating system, however, has been shown to be resistant to NMP for 14 full days even under the most robust of testing conditions, i.e., under glass.

In a series of tests, the surface of a panel treated with the coating was exposed to NMP for four, six, eight, ten, and twelve hours. The coating was then visually checked for swelling, gloss change, haze, and any other changes. Scratch pencil hardness was also tested, using 3H and 6H pencils, immediately and one-hour post exposure. The researchers found no visual signs of change, and all panels passed the scratch test.

Sherwin-Williams has also worked with a partner to perform on-site testing of the coatings' NMP resistant properties with their slurry and insulation.

Together, these studies show that the modified urethane coating system could help reduce the risk of NMP exposure-related flooring deterioration and aid the effective clean-up of the substance at EV battery plants.

Carbon black slip hazard

Carbon black is a graphite-like material used in the battery slurry for both anode and cathode manufacturing. Its fine particles are deposited onto production floors during manufacturing processes and are then picked up by people and trolleys and carried throughout the facility.

This can be a huge slip risk. In fact, when Sherwin-Williams measured the dynamic coefficient of friction of epoxy floors exposed to carbon black, it did not even register a reading on the instrumentation. In other words, the floor would be more slippery than ice.

Smooth floors are essential for the easy cleaning of carbon black contamination. Yet the aggregates commonly added to resin floors to increase slip resistance can have the opposite effect, resulting in a textured surface that makes clean up challenging.

Sherwin-Williams' specialist carbon black resistant coating, however, provides a smooth and easy-to-clean finish. What's more, it has a slip coefficient reading of 0.72, close to the industry standard of 0.42, reducing the slip hazard even between cleanings.

Fire safety

Fire safety is, of course, an essential consideration in any facility. But Li-ion batteries can release flammable, toxic gases when failing or overheating, and these can trigger a fast-spreading, difficult-to-extinguish fire.

A typical building fire will generate heat of around 1,000°C,[2] but steel, a common material for beams and pillars, will lose around 50% of its strength at just 593°C.[3]

Fire resistant coatings expand under heat to protect the underlying steel for as long as possible, providing a potentially life-saving a window for staff evacuation.

Quality by design

In construction, best practice involves building facilities that are easy to clean, using materials and processes that reduce risk as much as possible. There is, however, a lack of data on the best solutions to the unique challenges of EV battery facilities.

Sherwin-Williams, the first company to test its coating solutions in EV battery facilities, is proud to be part of the move to change that. We have shown that specialist coatings can reduce and mitigate the risks associated with NMP erosion, carbon black trips and slips, and battery-related fires from the start, and make for more efficient running of plants on a day-to-day basis.

As the industry matures, we will continue to test and prove the performance of our solutions, to help members of this relatively new sector embrace the opportunities – and build risk management into construction from the floor up.

Top middle
Traditional epoxy floor damaged by exposure to NMP.

Top right
Robots assembling battery pack from battery modules.

Inset
Carbon black being spread via wheeled traffic creating slippery floor.

1 Construction Dive. (2024). EV battery plant construction booms even as automakers hit the brakes. Available at: https://www.constructiondive.com/news/ev-battery-plant-construction-booms-demand/. Last accessed: 14 May 2024.

2 NIST. (2006). National Institute of Standards and Technology (NIST) Federal Building and Fire Safety Investigation of the World Trade Center Disaster Answers to Frequently Asked Questions. Available at: https://www.nist.gov/pao/national-institute-standards-and-technology-nist-federal-building-and-fire-safety-investigation. Last accessed: 14 May 2024

3 AISC. (n.d.) Available at: https://www.aisc.org/steel-solutions-center/engineering-faqs/11.2.-steel-exposed-to-fire/#9370. Last accessed: 14 May 2024

Sherwin-Williams helps to create the building blocks of success at Blackpool's £100m government office

Sherwin-Williams' innovative solutions were selected for use in the construction of a £100 million government office building in Blackpool, UK this year. The 19,975m², seven-storey structure is being built on King Street and will accommodate more than 3,000 civil servants. The development, from main contractor Vinci Building, forms a key part of the £350 million Talbot Gateway regeneration project, which aims to expand footfall in the town centre and enhance job prospects for local residents.

The building is constructed around a prefabricated steel frame, coated in Sherwin-Williams' passive fire protection solutions. Formulated to expand when subjected to fire, intumescent coatings create a substantial, insulating layer that increases the amount of time it takes for steel to heat up to the point of losing its load capacity, and static stability. The steel frame was produced by Leach Structural Steelwork, which is responsible for applying FIRETEX® FX6002 to the external areas. Meanwhile, JM Passive Fire Protection is responsible for applying FIRETEX FX1003 and FIRETEX FX6010 to the internal steelwork.

The correct level of protection could only be ascertained by gaining a thorough understanding of the structure. Sherwin-Williams' Fire Engineering and Estimating Team (FEET) analysed the design scope of the building and provided product solutions and estimates that met the project requirements. FEET determined that the required 90-minute fire rating could be achieved by using FIRETEX FX6002.

FIRETEX FX6002 is primarily designed for off-site applications. It offers the briefest time between application and handling for fire resistance periods of up to two hours, while its mechanical durability reduces the risk of damage during transportation and installation. It also features Volatile Organic Content (VOC) levels that are comparable with many of today's water based intumescent products.

The ultra-fast drying benefits of FIRETEX FX6002 are recognised by Leach Structural Steelwork's production manager, Jonathan Leach, who says: "Obviously the external structure is a vital part of the initial stages of any project. We were given a tight deadline to get the steelwork to Blackpool and the fast curing of FIRETEX FX6002 enabled rapid throughput at our production facility, which helped us to achieve the specified timeframes."

FEET recommended JM Passive Fire Protection apply a combination of FIRETEX FX1003 thin-film and FIRETEX FX6010 rapid curing intumescent coatings to all the internal steelwork sections. Once cured, Sherwin-Williams' high solids, tin free polyurethane Acrolon® 7300 will be applied as a fast-drying topcoat. Acrolon 7300 has excellent resistance to atmospheric exposures and maintains gloss and colour, even in highly corrosive environments such as those found in Blackpool.

The building is scheduled for completion in March 2025, when staff from the Department for Work and Pensions will transfer from existing sites in a move estimated to boost the town centre economy by up to £8 million a year. Nathan Mangnall, business development manager at Sherwin-Williams, concluded: "We're delighted to have been able to supply our market leading coatings for use in this state-of-the-art building, which will make a big difference to the people of Blackpool. This project was won by demonstrating our technical expertise to Vinci Build, Leach Structural Steelwork and JM Passive Fire Protection in what was real team effort from all areas of Sherwin-Williams."

Offshore wind farm maintenance: A new coating toolbox

By Claus Ackfeld, Product Manager, P&M, Joao Azevedo, Segment Leader, Energy - EMEAI, and Neil Wilds, Global Product Director - CUI / Testing, at Sherwin-Williams Protective and Marine.

The offshore wind power sector is growing fast, but protecting these structures against corrosion in this aggressive environment can be problematic. Originally their protection relied on the standards Norsok M-501[1] and ISO 12944-9[2], which give guidelines specific to the oil and gas industry, but which were not necessarily suitable for the renewable sector. As a result, many early offshore wind towers suffered premature corrosion.

Such assets are subject to early coating breakdown and corrosion, particularly in the inter-tidal and splash zones, due to a combination of factors. These include exposure to the most aggressive CX offshore atmospheric corrosiveness[2], being unmanned, with no crew present for regular inspection or maintenance, and experiencing structural movements that are much more pronounced than oil and gas offshore assets. There are also doubts about the usual offshore oil and gas coating specifications required to provide extended durability when facing such aggressive conditions. Over the years many coating systems have been used, including ceramic, solvent-free, glass-flake, and polyester, but premature corrosion breakdown has been detected in all systems used in the field.

The systems applied at new build to protect offshore wind foundations have not reached the 30+ year protection lifetime yet, and probably never will – despite misleading predictions based on compositional requirements (as per the existing standards). As no one system currently meets the expectations of the offshore operators, there is a need for a novel cost-effective maintenance coating system.

There is no ‘silver bullet’ system which meets all the requirements at new build, and major offshore energy companies are now setting-up pre-qualification programmes for new build coating systems.

Hence, the offshore wind operators are facing two important needs to ensure a prolonged life in an aggressive environment. The first is redefining the new construction coating specifications to assure the required durability, without the comfort of misleading oil and gas-based compositional coating standards, or track records, and the second is finding maintenance solutions that address both the lack of environmental conditions control, and difficult access. This article covers this second need.

1 Norsok M-501 Rev 6.

2 ISO 12944-9 Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 9: Protective paint systems and laboratory performance test methods for offshore and related structures.

3 ISO 11507 Paints and varnishes – Exposure of coatings to artificial weathering – Exposure to fluorescent UV lamps and water.

4 BS 3900 F2 Methods of test for paint. Durability tests on paint films. Determination of resistance to humidity (cyclic condensation.)

The new maintenance coating tool box

Maintenance and repair coating application differs from a new build / shop application situation in two key aspects. There is reduced control over surface preparation quality and environmental conditions, and difficult access to the areas to coat, making it far more time consuming.

Two technologies developed by Sherwin-Williams can enable asset owners and contractors alike to mitigate the negative impact of these challenges in terms of cost, time of execution, and quality of the protection. Both technologies address the need for surface preparation tolerance and are solvent-free. One is more tolerant to moisture, low surface profile and flash rust, and suitable for larger repair projects (Dura-Plate™ 301W). The other is designed to facilitate the early repair of small areas of damage in difficult to access areas or during day-to-day operations by less skilled staff (Repacor™ SW-1000). The latter is also a proven effective solution to repair damages during handling, transportation and installation of the offshore structures.

The uniqueness of both these technologies can expand owners and contractors options when designing asset maintenance cycle. This is true for a vast array of energy and infrastructural assets, if being considered early in the maintenance cycle. One specific activity provides the best example though: offshore wind structures.

Maintenance Solutions

Before maintenance painting, surface condition is important, and preparation needs to be minimal due to access/skilled labour availability. Considerations also when to conduct spot repair, or more major repainting to extend life. With regular inspections, maintenance intervals can be dependent on percentage breakdown of the protective coating. As access is difficult offshore, cost effectiveness of any maintenance system is important, plus there is also a need to reduce amount of downtime.

Dura-Plate 301W

For repair of larger surface areas, Dura-Plate 301W, a surface tolerant 2k, is an ideal solution.

Dura-Plate 301W is the latest evolution of the Dura-Plate 301-series of products, with a track record in offshore and onshore application spanning over 25 years, and with over 15 million m² protected in offshore projects alone. It is a low-temperature application and curing version of the Dura-Plate 301K ultra-surface and moisture-tolerant high-solids epoxy coating platform. Dura-Plate 301W may be applied at ambient, and substrate temperatures as low as 2°C. It is engineered to provide outstanding adhesion and anti-corrosion performance over a wide range of surface preparation techniques including water jetting, abrasive blasting, and hand or power tool cleaning. The unique formulation of Dura-Plate 301W allows it to be applied over damp and medium flash rusted metal substrates (tolerant to Wa2 M – ISO 8501-4) and without dew point restrictions. It is tolerant to low surface profile roughness, and is easy to apply by single leg airless spray, brush, or roller. A typical coating system would be 2 x 125-150µm. These characteristics significantly broaden the acceptable application windows to drive efficiencies in coating schedules, for both new construction and maintenance projects, and making the product ideal for offshore wind tower structures.

Dura-Plate 301W has been assessed by operators in both the offshore and onshore energy sector for its adhesion to damp, low profile, and abrasive blasted surfaces, and its suitability as a surface and humidity tolerant coating to reduce traditional downtime in maintenance painting due to weather conditions.

The performance of a single coat of Dura-Plate 301W on rusty steel (prepared to St3) was assessed after 5,000 hours exposure to artificial weathering (ISO 11507)[3] and humidity (BS 3900 F2)[4]. No coating defects were observed in either test.

Third party testing confirmed the excellent adhesion of a single coat of Dura-Plate 301W at an average DFT of approximately 250µm, to various substrates (damp, low surface profile) all cured under 100% relative humidity, with average pull-off adhesion above 15MPa, and where the failure mode was either cohesive or partially glue failure (Figure 1).

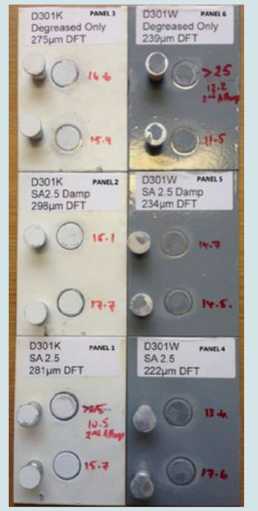


Figure 1: Dura-Plate 301W Panels after pull-off testing, showing failure mode and measured values. Figure also shows results from adhesion testing of a previous version of the Dura-Plate 301 series.

Note: top dollies on Panels 1 and 6 show result after second attempt to pull. First attempt showed no failure, with dollies in place after interrupting pull-off when dial reach 25MPa (maximum)

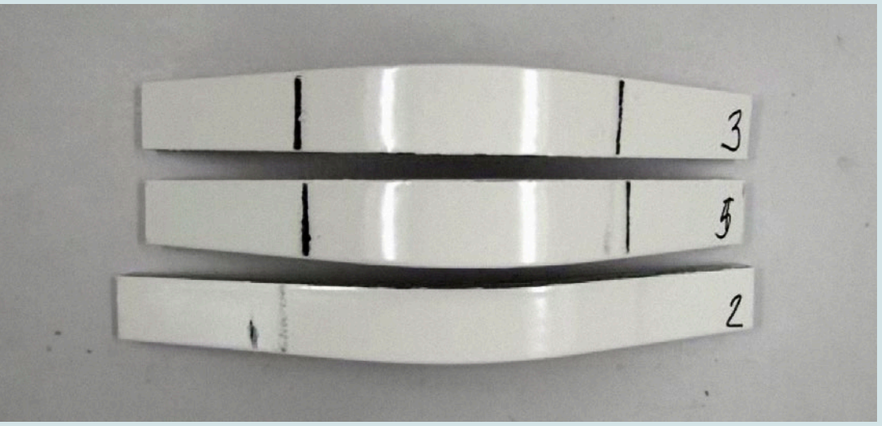


Figure 2: Dura-Plate 301W Flexibility samples after 4-point bend testing.

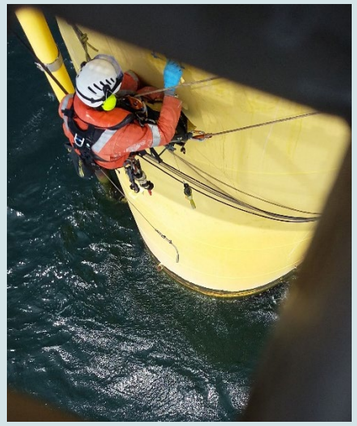


Figure 3: Rope access technician conducting spot repair.

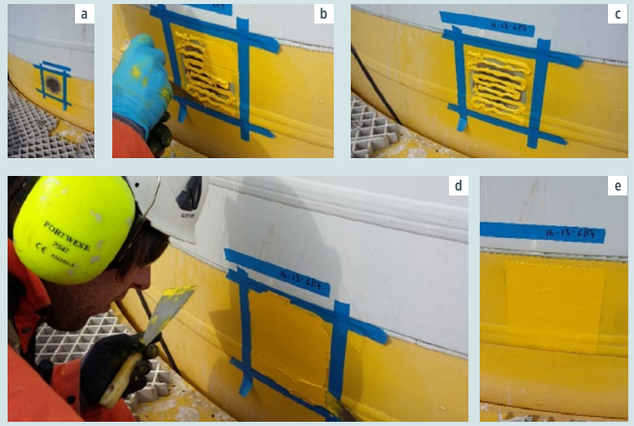


Figure 5: The application stages of Repacor SW-1000 maintenance coating.
(a) Area prepared, (b and c) Applying the Repacor,
(d) smoothing the applied material, (e) Finished repair

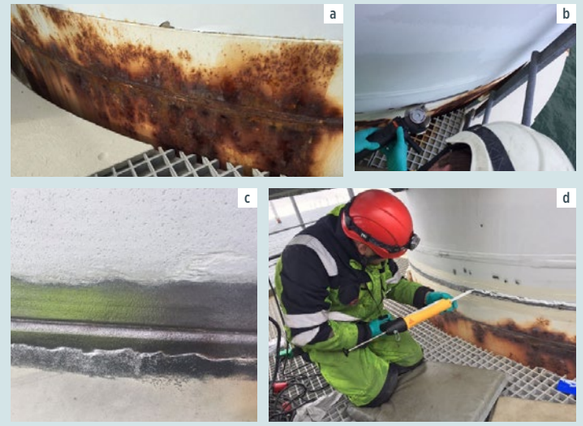


Figure 6: Preparation and application of Repacor SW-100.
(a) Rusted area to be repaired, (b) Preparing the surface,
(c) The prepared surface ready for coating, (d) Applying the Repacor SW-100

No detachment was observed between the coating film and the substrate in any of the 12 pull-off readings performed over six panels. In addition, no meaningful difference or trend was detected between the adhesion over dry abrasive blasted steel and adhesion over damp or smooth non-blasted steel. Curing at the 100% humidity and temperatures tested, was normal and did not impact the results.

A third-party laboratory was commissioned to carry out flexibility testing of Dura-Plate 301W coated samples using a four-point bend method. Ten sample plates (250 x 25 x 6mm) were coated with a single coat Dura-Plate 301W at an average DFT of 220µm, and evaluated at 3% and 5% strain testing (Figure 2).

No cracking or failure was observed after testing at either 3% strain and 5% strain.

In a further evaluation by an offshore maintenance services company, the report stated that during application it was clear that the Dura-Plate 301W was easy to apply with brush and roller. The coating spread smoothly, and once dried, the surface became smooth and glossy. When applied with a brush in the usual manner, it is easy to achieve a dry film thickness ranging from 150 to 200µm. With the necessary attention, a dry film thickness of 250 to 300µm with just one coat on flat and easily accessible surfaces, was easily achieved. The adhesion of the Dura-Plate 301W on a Sa 2.5 blasted substrate was good. Even under extreme conditions (exaggerated) with a too-wet surface, the adhesion remained good, and the adhesion on the substrate exhibiting heavy flash rusting (Grade H) even achieved an adhesion value of 8MPa.

When evaluated as a maintenance coating system at an onshore asset, it was found to be effective in reducing downtime during scheduled maintenance by around 70%, which computed to cost savings of around £135,000.

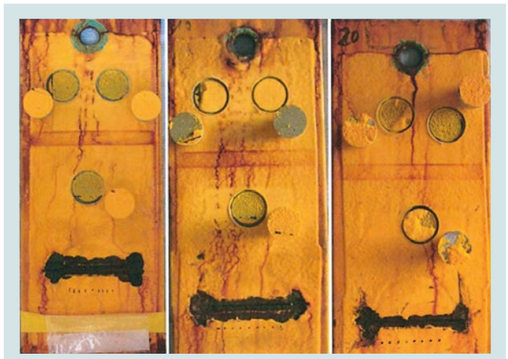


Figure 4: Pull-Off adhesion test, and scribe corrosion test results.
Note: the central section of the scribe shows the repair area

Repacor SW-1000

For small area (spot) repair, Repacor SW-1000, is very suitable, and has a good record in this application.

The advantage of this product is that it is a two-component solvent-free ultra-fast drying coating supplied in a cartridge, which can easily be applied by less-skilled staff, e.g. rope-access technicians (Figure 3).

Repacor SW-1000 is the result of a three-year research product by Sherwin-Williams to develop a coating solution that could simplify maintenance repair work on offshore wind structures. The safety of rope-access applicators using this product was also a prime consideration in the development. Compared to the two to three layers needed with traditional technologies, it requires only a single layer coating, easily dispensed using a standard sealant gun, without the need for mixing, to obtain the necessary performance. Repacor is compliant with NORSOK M-501 and meets the highest standards in anti-corrosion protection.

Repacor SW-1000 has all the properties of traditional multi-coat protection systems built into a single coat of 500µm dry film thickness. Despite the single coat, it is expected to mimic the original performance of offshore wind structure coating systems. It is UV-resistant, and no additional topcoat is needed, which is a major advantage in offshore environments. It also has a cure time that is around four hours faster than alternative aerosol systems, and the unique cartridge application process means the applicator can effectively work from a backpack, meaning applicators need only make one journey to carry out the task, and waste packaging is also minimised.

Both a battery-operated bristle blaster for surface preparation, and the cartridge of Repacor, can be carried in the backpack of a rope access technician, enabling an easy to apply one-coat fix, saving money and time.

In addition, one of the main properties needed from a repair system is good adhesion to the existing substrate after suitable preparation, together with continued good corrosion protection. Third-party testing was carried out to determine both the adhesion of Repacor SW-1000, and its suitability to provide corrosion protection in this environment.

Coated steel panels, which had been exposed to a corrosive environment, were repaired using Repacor SW-1000 and then subjected to 4,200 hours of cyclic corrosion protection tests in accordance with ISO 20340 Annex A, after removal of the damaged coating by spot grit basting to SA 2½, and manual application of one coat of Repacor SW-1000 at 500µm DFT.

After testing, which was carried out by Fraunhofer IFAM, Bremen, Germany the panels were visually assessed followed by adhesion testing and measurement of corrosion at the scribe. The results are given in Table 1 (page 28) and Figure 4.

Adhesion after qualification testing was > 9MPa (100% cohesive break), there was zero degree of blistering, rusting, cracking, flaking, and chalking, and corrosion at the scribe of the repair area averaged 2mm.

Examples of spot repairs using Repacor SW-1000 carried out in the field are shown in Figures 5 and 6.

Repacor SW-1000 is transforming the maintenance and repair of offshore wind turbines towers. It is an excellent solution for onshore industrial environments if a simple-to-apply, high-performance, durable and cost-effective coating is required.

Table 1: Test results for system, 1x Repacor SW-1000

Evaluation before exposure: System Repacor SW-1000				
		Specimen 1	**Specimen 2**	**Specimen 3**
DIN EN ISO 2808	Film thickness [µm]	506 - 607	539 - 692	497 - 544
DIN EN ISO 4624	Adhesion strength [MPa]	8.7MPa	8.2MPa	8.3MPa
	Failure type	10% AB 90% B	10% AB 90% B	10% AB 90% B
Evaluation after exposure: System Repacor SW-1000. Duration: 4,200 hours (500um)				
DIN EN ISO 4624	Adhesion strength [MPa]	10.5MPa	9.3MPa	9.8MPa
	Failure type	100 % B	100 % B	100 % B
Corrosion at the scribe	[mm]	2.6	1.6	1.8
DIN EN ISO 4628-2	Degree of blistering	0 (SO)	0 (SO)	0 (SO)
DIN EN ISO 4628-3	Degree of rusting	Ri 0	Ri 0	Ri 0
DIN EN ISO 4628-4	Degree of cracking	0 (SO)	0 (SO)	0 (SO)
DIN EN ISO 4628-5	Degree of flaking	0 (SO)	0 (SO)	0 (SO)
DIN EN ISO 4628-6	Chalking	0	0	0

New Maintenance Strategy

In addition to having a new maintenance coating toolbox for offshore wind structures, a new strategy is proposed to ensure a long-term successful operation of wind farms.

If we look at the experience gained by operators in the offshore oil and gas sector, then regular inspection and maintenance is the key to protection of these platforms over the life of the field, and thus maximum revenue generated.

However, there is a big difference between offshore oil and gas assets and wind tower structures. Oil and gas platforms are manned, with access to continuous inspection for any corrosion problems, and the ability to carry out spot repairs to the coating before the breakdown gets serous requiring major repainting. Offshore wind structures are unmanned, so currently any inspection of the tower and maintenance painting is not straightforward.

As mentioned above, the major areas of coating breakdown and corrosion, due to alternating wet and dry periods are at the intertidal and splash zones, as with oil and gas platforms, in addition to impact/abrasion damage in these areas caused by boat access. These are the areas on offshore structures that are difficult to access. However, there is a strategy which could be put in place to help. The wind turbines/blades themselves need maintenance over the lifetime of the wind farm to ensure long term successful operation. Currently, to determine any maintenance (or replacement) of the turbine blades, they are inspected at regular intervals, for example in the first five years of operation, then roughly at 10-year intervals. This is carried out by technicians sent out by vessel to the tower. These, rope access, technicians could also be used to inspect the base of the tower, and apply Repacor to any damaged areas with minimum training, thus helping to ensure long term corrosion protection.

Figure 7: Wind blade inspection

Conclusions

Solutions serving the most demanding scenario of offshore wind structures will perform well in any other maintenance and repair situation. The relative usefulness and cost-benefit balance of Dura-Plate 301W and Repacor SW-1000 approaches will be different in a case-to-case basis, which is why it is important to count on both solutions in the maintenance and repair tool box. Each one alone or in combination can be used in offshore oil and gas, onshore energy assets, bridge and highways and other situations wherever difficult applications conditions act as barriers to achieving durability of repairs using conventional solutions.

Sherwin-Williams takes Resuflor WB's environmental credentials to the next level

The latest generation of Sherwin-Williams pioneering Resuflor® WB water-based epoxy floor and wall coating was launched in 2024. Complementing its new and improved formulation, Resuflor WB now complies with a wide range of third-party environmental certifications, including LEED v4 and v4.1 BETA, European National Regulations on VOC Emissions and BREEAM, that help meet the need for sustainable building design and construction practices.

Materials used for new flooring and wall projects, refurbishments, and repairs are now scrutinised and evaluated to meet the ever-increasing standards and demands of designers and specifiers. Increasingly, water-based coatings with low Volatile Organic Compounds (VOC) are the preferred option. Resuflor WB two-component epoxy meets this requirement* alongside excellent adhesion to concrete and other surfaces, ensuring high levels of chemical and abrasion resistance with colour retention that looks good and resists yellowing.

Two of the most well-known rating systems for green buildings are Leadership in Energy and Environmental Design (LEED) and the Building Research Establishment Environmental Assessment Method (BREEAM). They both set standards and measure the environmental performance of buildings, including their construction, infrastructure and operation. Resuflor WB has achieved BREEAM international compliance with 'exemplary' criteria on VOC emissions and is also LEED v4, v4.1 BETA compliant. It also meets France's VOC Regulation A+, Germany's ABG and AgBB, Belgium's VOC and Italy's CAM criteria.

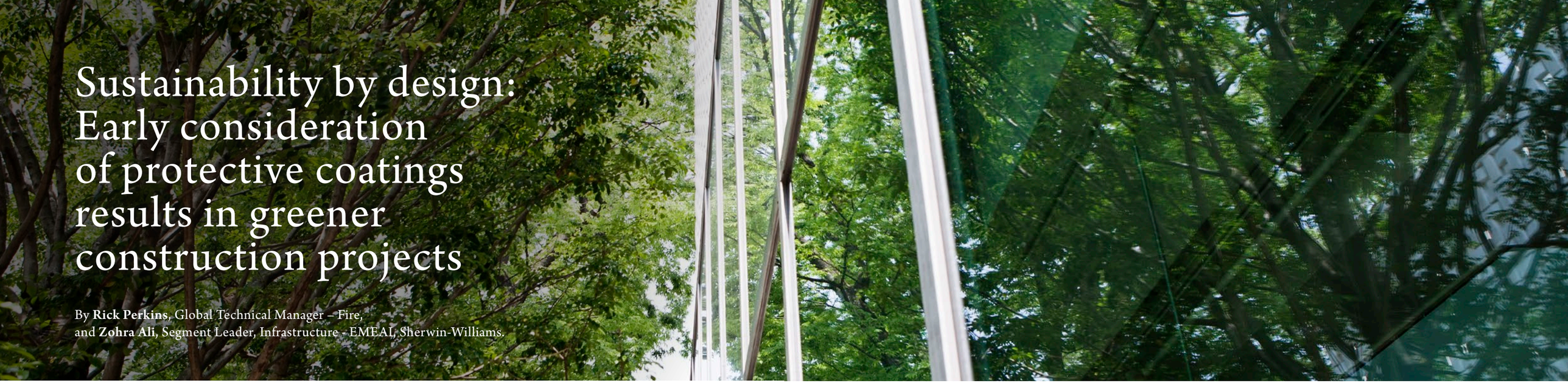
In addition to these certifications, Resuflor WB has third-party verified Environmental Product Declarations (EPDs) based upon complete lifecycle assessments. Sherwin-Williams' EPDs highlight the company's commitment to measuring the environmental impact of its products and services and reporting these impacts in a transparent way.

Resuflor WB is perfect for use in high-traffic areas with heavy footfall, such as schools and other educational establishments, hospitals, laboratories, shops and retail environments, as well as commercial and office-based premises. Providing attractive, hard-wearing, dust-free finishes, its improved chemical and abrasion resistance also makes it ideal in industrial units and warehouses, automotive showrooms and workshops, as well as aerospace manufacturing sites and hangars where it can resist chemicals, including vehicle and aviation fluids.

As a low-VOC solution, Resuflor WB can be applied without the need to vacate a building, thereby ensuring 'business as usual' and maximising productivity. Its use also contributes to better air quality for building occupants, ensuring compliance with industry and public standards.

"Sustainability related features are becoming a high priority when selecting products and manufacturing partners", comments Admir Avdovic, Product manager for Flooring - EMEAI, at Sherwin-Williams. "Having LEED and BREEAM compliance alongside a number of other prestigious certifications confirms that Resuflor WB can contribute toward achieving green building status."

* Eurofins, 4 March 2024, Attestation for Resuflor WB according to: LEED v4 and v4.1 Beta 'Low-Emitting Materials' for LEED projects outside the US and globally; BREEAM 'Exemplary' criteria on VOC emissions (International, UK, NL, SE and NOR); European National Regulations compliance with French VOC Regulation of March and April 2011 showing emission class A+, German ABG/ABB, Belgian VOC and Italian CAM.



Sustainability by design: Early consideration of protective coatings results in greener construction projects

By **Rick Perkins**, Global Technical Manager – Fire,
and **Zohra Ali**, Segment Leader, Infrastructure - EMEAI, Sherwin-Williams.

With the construction industry accounting for almost 40% of global greenhouse gas emissions[1] the pressure is on to move to more sustainable procedures and practices.

In a bid to meet net zero commitments, the sector has embraced all manner of new approaches, from replacing concrete slabs with timber and maximising material preservation during refurbishment to modular construction.

One area that has so far been neglected, however, is protective coatings. Yet by engaging with experts early on, developers and architects can make significant CO_2 savings – not to mention reduced labour and downstream maintenance costs.

A changing landscape

Sustainability is no longer an option in our sector. Just like most big brands and organisations, all the major construction companies have made net zero commitments, and end users are demanding their projects are greener.

A few years ago, the big question for most constructors was how to make a striking building that stands out - now, it is how to construct a more sustainable building.

This may be a compulsory transition, but in no way will it be an easy one. With construction being responsible for nearly 40% of global carbon emissions and a similar proportion of energy usage,* achieving the necessary level of change requires a wholescale rethink of how construction projects are designed and implemented.

Examples we have seen so far have been structural in nature. They have included the utilisation of modular construction, which reduces waste and transportation-related emissions and makes buildings reusable, as well as a trend to, at least partially, replace CO_2-intense concrete with timber. There has also been a shift towards renovation over new-build construction, with a focus on preserving original materials wherever possible. Many inner-city projects, for example, are incorporating existing wrought iron into designs, rather than replacing it with steel.

One area with the potential to make a big difference, however, is often overlooked: intumescent coatings.

Why focus on coatings?

Coatings impact on sustainability decisions, both in the context of evolving construction practices, and in their own right.

Firstly, the trends towards more sustainable building practices alter the underlying equations of intumescent coating calculations. There is, for example, currently no standardised method of testing requirements for passive fire protection on timber and steel hybrid structures, and commercially available products have not been tested on wrought or cast iron. As such, developers have limited information on which coatings, in which volumes, they need to use in order to meet regulatory requirements.

In addition, coatings contribute to the overall environmental impact of a project, as fire protection typically involves fairly significant quantities of coatings. Corrosion protection and decorative paints are normally applied at a fraction of a millimetre, but an intumescent coating could require an application of 5mm in depth, so it might have a more significant environmental impact on the project as a whole.

Optimising the use of coatings can also deliver the added benefit of cost savings, as anything that brings control and predictability to construction is going to be more sustainable, but also more cost-effective. Appropriately selected and applied coatings will last for the lifespan of the building, offering a 'fit and forget' model that reduces downstream maintenance costs.

Taking early, considered action

The first step to optimising the use of coatings is early consideration. By accessing the right tools and expertise at the design stage, developers can tap into the information they need to guide decisions on design elements, such as how to structure a project to enable the most efficient use of coatings

Steelwork size, for example, will directly affect the type and thickness of intumescent coating needed to meet safety standards and regularity requirements. Considering the steel frame design in isolation from the fire protection would likely result in the lowest cost, lowest weight steel frame, being selected.

However, this can result in increased fire protection product and application costs later on. As such, fire protection needs to be discussed at the design stage, not the construction stage. It's not uncommon to see problems that could have been avoided if early engagement had happened and, in some cases, no viable option on protecting the structure remains, because of the way it has been designed.

Early, considered optimisation, however, can balance the costs and the environmental impact of steel and coating from the start – and is an approach that is expected to be backed in both an upcoming Association for Specialist Fire Protection advisory note 33, and yet to be published Royal Institute of British Architects advice to architects.

Both will make the point that early engagement with intumescent coating experts makes all the difference. There are a number of things industry-leading suppliers can do to help build sustainable, optimised fire protection into a project from the design stage. Firstly, they have the in-depth knowledge on how their products work in emerging scenarios, such as on timber floors or cast-iron structural elements.

Some will also have tools that allow developers and architects to calculate the carbon dioxide equivalent (CO_2e) of the coatings required for a given building design, allowing them to adjust accordingly.

Sherwin-Williams, for example, can provide Environmental Product Declarations (EPD), which quantity quantify the environmental information about the life cycle of a product, for all its fire protection coatings. In addition, the company's free-to-use FDE software includes a design estimator, which helps teams calculate exactly how much fire protection would be required, depending on beam dimensions steelwork design. Using these tools, we can look at different engineering approaches, and how we can reduce embodied carbon by balancing the protection and the use of steel.

Engaging with industry-leaders will give developers access to the specialised knowledge-based advice they need to optimise structural design and protective coatings.

Sustainability: A shared mission

There is no escaping the need for a more sustainable construction industry. Green pledges and net zero commitments are everywhere we look. What is less obvious is how we get there.

Which is why, as we move towards a different way of working, we all need to work together. Because sharing our expertise, our best practice, our successes and our failures is the only way we, as an industry, will be able to achieve our joint goals

* Forbes. (2024). The Future Of Construction: Why Sustainability Is A Hot Topic. Available at: https://www.forbes.com/sites/louismosca/2024/05/03/the-future-of-construction-why-sustainability-is-a-hot-topic/ Last accessed: 22 July 2024

Using ISO 12944 to guide right-first-time steel protection that prevents avoidable costs

By Malcolm Morris, **Technical Manager - EMEAI, at Sherwin-Williams Protective and Marine.**

When it comes to steel corrosion, prevention is always better than cure. Correct first-time beam protection at construction reduces the need for costly shutdowns and avoidable maintenance and remedial work later on.

Working to ISO 12944 standards can help stakeholders determine the types and thicknesses of coating products needed to keep their building in the best condition for years to come. But interpreting the categories and understanding the underlying considerations can sometimes be challenging.

Here, we take a look at the standard and how it helps categorise corrosion risk, as well as the additional considerations that can help individuals or teams make informed, future-proof decisions.

What is ISO 12944 and why does it matter?

The corrosion of structural steel is an electrochemical process, requiring the presence of both moisture and oxygen at the same time. As the iron in the steel is oxidised, it produces rust, which can seriously weaken a structure with potential for failure, as well as looking unsightly.

Specialist coatings can protect the metal from the surrounding environment, mitigating the development of corrosion. With the required coating specification being dependent on exposure levels, however, determining product and application specifications can be challenging.

The cost of getting it wrong can be high. When steel corrodes, it can force companies to shut down assets for highly expensive remedial work, the costs of which are often compounded by a loss of revenue in the interim. The costs of access, scaffolding, labour and possession of an asset for maintenance will far outweigh the cost of the paint itself.

ISO 12944, the industry standard for corrosion protection of steel structures by protective paint systems, can help organisations select and apply the most appropriate coating for their project, and avoid these preventable costs.

Originally published in 1998, the latest version was released in 2018, and it applies to all carbon steel used in new builds. While ISO 12944 is currently being updated as part of the standard five-year review process, it is the 2018 version that applies, and can help guide informed steel coating decisions. Following the guideline helps ensure steel is protected adequately, according to the environment it will be situated in, and prevent the downstream expenses related to corrosion.

Categorising corrosivity

For many organisations, decisions around steel coating involve a balancing act between preventing avoidable costs in the future, and keeping costs under control at construction. Yet the level of protection required depends purely on the level of exposure, which is dictated by the environment.

The scientific method for project classification involves placing steel or galvanized coupons in the given environment for minimum of 12 months, and measuring the rate of metal loss.

This is, of course, not feasible or convenient in the fast-moving world of construction, so ISO 12944 part 2 provides narrative categories to guide classification:

- **C1** (very low risk of corrosion): interior: heated buildings with neutral atmospheres
- **C2** (low risk): exterior: atmosphere with low level of pollution; interior: unheated buildings with risk of condensation
- **C3** (medium risk): exterior: production rooms with high humidity; exterior: urban and industrial atmospheres
- **C4** (high risk): interior: chemical plants, swimming pools; exterior: industrial areas and coastal, areas with moderate salinity
- **C5** (very high risk): interior: buildings with constant condensation; exterior: industrial areas, high humidity and aggressive atmospheres and coastal areas
- **CX** (extreme risk): Offshore marine or onshore areas of intense corrosivity which require special attention.

Categorising considerations

Determining the category of a given project, however, is not always a straightforward process.

Developers need to think about the environment as a whole, and in the context of local conditions. There is an argument, for example, that all UK locations are high risk, due to heavy rainfall and coastal proximity.

They should also consider weather conditions during construction and storage. Many projects are now modular, for instance, with steel being exposed to offshore conditions during transport from overseas. Others may involve steel intended for inside use being stored outside in the elements for a prolonged period of time before installation. It means that even steel intended for a C1 or C2 environment may be exposed to C5 or CX conditions during the construction phase of a project, leaving them vulnerable to damage.

Following categorization of the environment, the 'durability' of the coating system must be considered. The standard emphasized that 'durability' is **not** a warranty period, but gives an indication of how long the coating will be expected to last before it needs major maintenance, (With the understanding that the asset owner must undertake a regular regime of inspection of the coatings and perform minor remedial interim maintenance should the coatings have suffered localised damage or unexpected corrosion stress during their service life).

The standard durability ranges are:

'**Low**' Up to 7 years

'**Medium**' 7 to 15 years

'**High**' 15 to 25 years

'**Very High**' Exceeding 25 years

ISO 12944 part 5 defines model coating systems for all permutations of corrosivity and durability with normative (compulsory) stipulations for the minimum number of coats and the 'Minimum Nominal Dry Film Thickness' (MNDFT). The minimum thickness levels are agreed by the global panel of experts on the standards working group and are set to prevent cost-cutting erosion of film thickness levels in order to gain commercial leverage.

The corrosion protection performance of any paint system derived from part 5 is verified by accelerated test regimes that are set in part 6 of the standard, although very well-established systems with a real-time track record will also be considered as compliant with the standard.

Preparation and application are equally important, as even the most well-planned projects can fail if these steps are inadequate.

Right first time prevents avoidable costs

ISO 12944 offers a useful guide to steel corrosion protective coatings, yet implementing it requires a deep understanding of the relevant conditions, environments, and considerations.

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