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MARKET PULSE

ADVANCEMENTS IN COATINGS TECHNOLOGY

HOW PAINTS & COATINGS CAN HELP ACHIEVE SUSTAINABILITY GOALS

WHEN EVERY SECOND COUNTS - INTUMESCENT COATINGS

MAINTAINING STRUCTURAL INTEGRITY IS A NO-BRAINER WHEN IT COMES TO TANK LININGS

PROTECTING STEEL BRIDGES AROUND THE WORLD

BRINGING HOME THE BACON FOR DANISH CROWN

TESTING THE LIMITS FOR BIOFUEL REFINING

SHERWIN-WILLIAMS®

GLOBAL INDUSTRY & TECHNOLOGY EXPERTISE

FIND YOUR EXPERT

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. For more information, contact our experts directly, email us at swprotective@sherwin.com or visit sherwin-williams.com/protective.

ADMIR AVDOVIC
Product Manager Flooring – EMEAI
Admir.Avdovic@sherwin.com
See bio, page 13

Specialty:
High Performance Flooring

MALCOLM MORRIS
Technical Manager
Malcolm.Morris@sherwin.com
See bio, page 5

Specialty:
Technical

CARL BURRELL
Regional Market Director - Fire
Carl.Burrell@sherwin.com
See bio, page 11

Specialty:
Fire Protection

RICK PERKINS
Global Technical Manager –
Passive Fire Protection
Rick.Perkins@sherwin.com
See bio, page 7

Specialty:
Fire Protection

MICHAEL HARRISON
Global Product Director – Linings
Michael.Harrison@sherwin.com
See bio, page 19

Specialty:
Linings

JOACHIM PFLUGFELDER
PDM Manager
Joachim.Pflugfelder@sherwin.com
See bio, page 23

Specialty:
Bridges and Highways

resinflooring.sherwin.eu

protectiveemea.sherwin-williams.com

INSIDE

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LEARNING FROM THE PAST TO PROTECT THE FUTURE

After 150 years of being in business, Sherwin-Williams is known across the world as a pioneer in the development of paint and coatings. The Protective & Marine Division delivers smart asset protection to customers in a wide array of industries, including Civil Infrastructure, Manufacturing and Processing, and the Energy sector. Our liquid, powder, and intumescent coatings - as well as resinous flooring solutions - are proven to defend against corrosion, fire, chemical attack, wear and tear, and extreme temperatures.

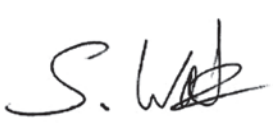
Sustainability, durability, productivity, and modularity are at the forefront of the protective coatings industry's evolution. Customers expect solutions that offer enhanced performance and versatility, and are more effective in a wide range of applications. Sherwin-Williams is continually pushing the boundaries of technology to exceed these expectations.

We also want to share our knowledge with our customers, which is why it gives me great pleasure to welcome you to the **first issue of Market Pulse for our EMEAI region.** Experts from across Sherwin-Williams have joined forces to bring you valuable information on all that's happening in our industry.

In-depth articles on how intumescent coatings ensure high levels of fire safety in modular buildings, the importance of storage tank lining maintenance, and why storing feedstocks for biofuel production presents challenges for the specification of tank linings are featured. Sustainability remains a hot topic and we look at what Sherwin-Williams is doing to eliminate volatile organic compounds in coatings.

There's nothing like putting our products to the test, so you can read about how the RAF's hangar at Teesside International Airport is benefiting from a cutting-edge floor surface and how our systems would help maintain structural integrity in event of a fire at Danish Crown's new production plant. You can also find out how we helped to make everything ship shape at the Port of Kiel-Holtenau, after a container feeder struck a 110-year-old lock gate.

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



Steffen Walz
Marketing Director Protective & Marine EMEAI
Sherwin-Williams

SUSTAINABILITY

THE JOURNEY TO SOLVENT FREE PAINTS AND COATINGS STARTS HERE

BY MALCOLM MORRIS, TECHNICAL MANAGER,
SHERWIN-WILLIAMS PROTECTIVE & MARINE

In November of last year, all eyes were firmly fixed on the United Nations Climate Change Conference (COP27), which took place in Sharm El Sheikh, Egypt. It's clear that countries around the world need to get serious about reducing carbon emissions but although government led strategies and targets are important, in order to turn ambition into reality every company in the paints and coatings sector must also play its part.

LEADING FROM THE FRONT

Manufacturing organisations should be acutely aware that the sustainability spotlight has turned on them and end users are increasingly asking about manufacturers' green practices and giving these initiatives greater priority when choosing paint and coatings suppliers.

The problem is that companies often issue broad, sweeping statements about their commitment to environmental responsibility, with a lack of substance that gives them ample room for manoeuvre to avoid being held to account. However, progress on this issue should always be made visible, with a transparent and detailed overview of an organisation's activities. Protecting the world in which we live for future generations is a core value at Sherwin-Williams and has been for more than 150 years.

It should come as no surprise that Sherwin-Williams produces durable, long-lasting coatings that boast extended lifecycles, minimising the need for replacement. However, we are also determined to use our expertise to accelerate the use of low or no Volatile Organic Compounds (VOC) paints and coatings.

From the plants where our products are manufactured to the point of purchase, Sherwin-Williams invests in sustainability initiatives guided by the needs of our communities and customers. We are actively developing coatings that reduce emissions, whilst being mindful of the needs of the paint applicators to be able to use these products without entailing excessive costs.

SETTING THE STANDARD

Product development is just one part of this very important picture though and Sherwin-Williams is committed to leading from the front by helping to develop, shape and refine industry standards. Whether it's Leadership in Energy and Environmental Design (LEED) or the Building Research Establishment Environmental Assessment Method (BREEAM), we keep environmental standards and regulations top of mind.

This also involves working with the wider industry, including trade associations and governmental bodies. Implementing VOC reduction strategies offers obvious environmental benefits, but we also need to ensure that the paint and coatings industry can work satisfactorily within any new legislation. I represent my company on various industry bodies including the British Coatings Federation's High Performance Coatings Group as chairman - a position I also hold on the CEPE's Protective Coatings Technical Committee and PC Sector Group - to help achieve this.

SUCCESS STORY

We are not alone in our strict adherence to the VOC Solvents Emissions Directive, the main policy instrument for the reduction of industrial emissions of VOCs. However, Sherwin Williams is at the cutting edge of solvent free corrosion protection and chemical resistant linings such as Dura-Plate® SW-501.

Dura-Plate® SW-501 is a prime example of zero VOC technology that has been established for some time and it has a successful track record in specialist offshore energy markets as well as waterways; however, it is now being pushed forward into further mainstream corrosion protection specifications.

Similarly FIRETEX® FX6002 is a quick drying Passive Fire Protection (PFP) material that has replaced traditional solvent based materials and gives massive reductions in VOC emissions – something that is particularly important as these products are typically applied as relatively thick films compared to 'normal' paints such as decorative or corrosion protection systems. It can

be handled in as little as one hour, while providing a highly durable and aesthetically pleasing finish, and also provides substantial savings in production times and site repairs and offers longer durability. This all goes a long way to reducing the cradle to grave environmental footprint of the PFP system and is just one example of our relentless focus on improving sustainability.

Significant improvements have also been made to the sustainable attributes of floor coatings. Most protective floor coatings have traditionally been petroleum or oil based with high VOCs, however, products are now available that utilise natural raw materials. Sherwin-Williams' FasTop and SofTop high performance resin systems comprise solvent free formulations that include the use of natural vegetable oils. Their credentials have been verified with Environmental Product Declarations (EPDs), which signal a manufacturer's commitment to measuring and reducing the environmental impact of its products and state transparently the full effect and influence of the material.

THE ROAD AHEAD

It's clear that, for the immediate future, solvent based paints and coatings are here to stay in certain sectors of the protective coating and passive fire protection markets mainly due to perceived costs. This perception has led to a conservative attitude towards technology changes - particularly if any new technology entails upfront costs to the end user in terms of material cost, new application equipment or improved drying facilities at their premises.

However, that attitude is beginning to change and even the more value-driven end users are realising that a small cost premium is worth it to mitigate the effects of our actions on the planet and give their organisation the necessary environmental credibility that the market is coming to demand.

ABOUT THE AUTHOR

Malcolm Morris is a technical manager with the Protective & Marine Coatings division of Sherwin-Williams (formerly Leigh's Paints). Malcolm started as a chemist with Leigh's 1978, with a career based mainly in R&D and technical service; but has taken on a broad role in supporting technical and commercial colleagues within the business, as well as customer facing technical support and training.

He has active involvement with CEPE Protective Coatings groups, the British Coatings Federation and sits on several British and ISO standards committees. Malcolm is a chartered scientist, fellowship professional member of ICorr, fellowship member of The Oil & Colour Chemists Association, and a AMPP Level 3 coatings inspector.
Contact: **Malcolm.Morris@sherwin.com**

FIRE PROTECTION

PROTECTING THE BUILDING BLOCKS

BY RICK PERKINS, GLOBAL TECHNICAL MANAGER – PASSIVE FIRE PROTECTION, SHERWIN-WILLIAMS PROTECTIVE & MARINE

With its low cost, timesaving and sustainability-based attributes, modular construction has seen tremendous growth in the last few years. Rick Perkins, global technical manager passive fire protection, examines the advantages of this approach and how intumescent coatings play a key role in ensuring high levels of fire safety in modular buildings.

Modular construction is the process of creating buildings using off-site prefabricated building components. These components are manufactured in a controlled environment and then transported to the construction site for final assembly. Although this method of construction has been around for decades, in recent years it has gained popularity due to its many advantages.

THE NEED FOR SPEED

One of the most significant advantages of modular construction is its speed. Building a traditional structure on-site can take months, if not years, to finish. Modular construction, on the other hand, can be completed in a fraction of that time. As modules are manufactured in a factory the construction process can be carried out much more quickly and efficiently.

Central to its popularity is the realisation that modular construction does not necessarily result in buildings of a temporary nature. The materials used and methods of constructing them mean that they are built to extremely high standards. The majority of today's modular buildings have steel frames and a design life of 50 years. However, it is highly likely that they will last longer than that – longer, in fact, than some so-called permanent buildings constructed in traditional ways.

Another advantage of modular construction is its cost effectiveness. Since modules are manufactured in a controlled environment, there is less waste and fewer materials are needed. These cost savings can be between 10-35 per cent less than traditional methods, according to the Royal Institute of Chartered Surveyors (RICS).

SAFETY FIRST

Being produced in a factory also means there are fewer hazards than on a traditional construction site – modular buildings are built to strict safety standards to ensure that they are structurally sound and safe for occupants. This is especially evident in their ability to protect against the potentially devastating effects of fire.

A large part of this is due to the intumescent coatings that are applied to the structural steel frames that are used in their construction. These are designed to expand when exposed to high temperatures, forming a thick, insulating layer that helps to protect the underlying steel from the heat of a fire. This delays, or prevents, structural failure and collapse, giving occupants longer to evacuate and firefighters more time to respond.

EVERY SECOND COUNTS

Since assembled modules are transported and erected as a unit, intumescent coatings make a great choice for fire protection as they are the lightest and most compact form of fire protection available. There are several types of intumescent coatings available, each with their own unique properties and application methods.

It is important to engage with a coatings manufacturer as early in the design stage as possible in order to ensure that the most appropriate solution is applied. Depending on the building's design and structure, intumescent paint has the ability to protect steelwork for 30, 60, 90 or 120 minutes in a fire, as required by the designer and building regulations. It is applied by airless spray to a thickness according to the level of protection required, and if the steelwork is visible in the final design, it will not detract from the appearance.

APPLICATION FORM

When applying an intumescent coating, it is important to follow the manufacturer's instructions and coating specification carefully to ensure that it is used correctly and provides the desired level of fire protection. This may involve applying multiple layers of the coating, preparing, and priming the surface before application and allowing the coating to dry and cure properly.

Using an appropriate intumescent product will mean that it is durable both once in service in the finished building, as well as during the construction/erection phase, when it may be exposed to weathering. Some of the latest generations of intumescent coatings are not only very fast drying, but they also have excellent mechanical resilience, making them a fantastic option when steelwork may need to be further worked on quickly after coating application.

LOOK AHEAD!

The future of modular construction looks bright, with increased adoption likely to transform the way we build and design buildings long-term. However, like any other type of building, fire protection should be a primary concern, so intumescent coatings from leading manufacturers should be used to provide an effective, versatile, and reliable solution. By providing a layer of insulation that protects the steel framework from heat, intumescent coatings can help to prevent structural damage and save lives in the event of a fire.

ABOUT THE AUTHOR

Rick Perkins works as the Global Technical Manager for Sherwin-Williams' passive fire protection range of intumescent and insulating coatings.

With an Honours Degree in Applied Chemistry and over 30 years' experience developing Fire Control product ranges, Rick is the Subject Matter Expert for the Sherwin-Williams Protective & Marine business with regard to passive fire and cryogenic spill protection supporting the product ranges both within the global business, and externally with specifiers and users of the FIRETEX product range.

Contact: **Rick.Perkins@sherwin.com**

THE SKY'S THE LIMIT FOR SHERWIN-WILLIAMS AT TEESSIDE INTERNATIONAL AIRPORT

HIGH PERFORMANCE FLOORING

Sherwin-Williams has announced that its pioneering Resuflor™ high build epoxy floor coating system has been successfully applied at a hangar in Teesside International Airport, the location for the Royal Air Force's (RAF) Interim Red Air Aggressor Training Service (IRAATS). A Resuflor™ Topcoat system has been used to ensure a reliable and robust floor surface for the L-159E aircraft that are being used to conduct combat training.

Ensuring that the 2,000m² hangar used by IRAATS has a floor coating that can withstand the rigours of activities that take place this was the responsibility of Darlington based specialist flooring contractor, MJF Group. The company's managing director, Martin Ferguson, said, "As you would expect from a project that involves the RAF, only the very best in class products could be used in order to offer the required levels of health and safety. We assessed a number of products from various floor coatings manufacturers and felt that Sherwin-Williams' Resuflor™ coating system offered the required protection and resistance to Skydrol."

Skydrol is a phosphate ester hydraulic fluid that is widely used in aircraft. It is fire resistant and retains a low viscosity at very low temperatures at altitudes of 10,000m or more, which are important considerations within aviation and aerospace. While highly effective, Skydrol is also incredibly corrosive and can easily damage a concrete floor if it is not adequately protected.

"Industrial epoxy resin flooring is impact resistant, fast curing and holds up well against fluctuating temperature changes," explained David Hockley, Regional Sales Manager, UK, at Sherwin-Williams. "Within the aerospace industry floors need to be able to resist the corrosive capabilities of Skydrol. Although there are various Skydrol resistant products on the market, Resuflor™ is the only one that is available straight off the shelf. While other manufacturers have to modify their existing products using expensive additives – with a price tag to match – Sherwin-Williams offers a readily available, cost effective and hardworking solution that also looks good."

MJF Group shotblasted the existing concrete floor and then used a diamond grinding process to correct irregularities such as minor pits and divots. A coat of Resuprime MVT was used and then two coats of grey Resuflor™ HB were applied – one 300 micron and one 250 micron – with quartz used in specific parts of the floor. In terms of maintenance, Sherwin-Williams has provided specialist tyre mark and oil removers, as well as general cleaning solutions, to achieve the breakdown and removal of deposits, maintain the aesthetic qualities of the floor and maximise its operational lifespan.

David Hockley concluded, "We are delighted that MJF Group used Resuflor™ for this project. The work that the RAF is undertaking at Teesside International Airport is of vital importance to us all at this time of geopolitical turbulence and we are proud to be able to play a role by providing a hardwearing and chemically resistant floor coating that is required in this environment. The RAF now benefits from a cost-effective solution that offers unrivalled protection against Skydrol and other contaminants."

FIRE PROTECTION

SHERWIN-WILLIAMS BRINGS HOME THE BACON FOR DANISH CROWN

Sherwin-Williams, the leading global manufacturer of paints and coatings, has announced that its innovative solutions are being employed at Danish Crown's new £100m bacon production plant in Rochdale. Set to produce more than 900 tonnes of bacon and gammon a week to UK welfare and food safety standards, the 30,500m^2 facility will use highly automated manufacturing equipment and the latest processing technology.

The cutting-edge facility is being constructed using 1,500 tonnes of internal prefabricated structural steelwork from Cambridgeshire based SDM Fabrication. The company's managing director, Richard Melton, commented, "In addition to the design, fabrication, painting, and on-site installation of the steelwork at the Danish Crown plant, we are also responsible for making sure that its integrity is maintained in the event of a fire. Already aware of the company's market leading range of intumescent coatings, I contacted Sherwin-Williams to find out if it could assist in meeting the project's fire protection requirements."

Colin Hepworth, area sales manager at Sherwin-Williams, said, "Our Fire Engineering and Estimating Team (FEET) carried out a structural analysis of the steelwork under fire loading. After FEET had crunched the numbers, it recommended that SDM Fabrication use FIRETEX® FX6002 for the prefabricated steel, along with FIRETEX® C69 primer."

Sherwin-Williams is actively developing coatings that reduce emissions and FIRETEX® FX6002 features volatile organic content (VOC) levels that are comparable with many of today's water based intumescent products. This is particularly important, as it is typically applied as a relatively thick film compared to 'normal' paints such as decorative or corrosion protection systems.

"FIRETEX® FX6002 can be used in environments up to C5 category, as per ISO 12944-2, and is primarily designed for off-site application," stated Colin Hepworth. "Ultra-fast drying and durable, it gives the shortest possible time from application to handling for fire resistance periods up to two hours. It can be handled in as little as one hour, providing a highly durable and aesthetically pleasing finish, while its excellent mechanical durability minimises transport and installation damage."

Although the majority of the steelwork coating is being applied off-site by SDM Fabrication, some if it is being carried out while the bare metal is in-situ. For this purpose, and to avoid exposure to VOCs, Sherwin-Williams recommended its FIRETEX® FX5090 water based intumescent coating with Macropoxy 400 primer. FIRETEX® FX5090 is designed for application by airless spray to provide fire resistance for periods of up to 120 minutes on structural steel.

FEET's unique blend of experience and expertise means it can offer fire engineering information and solutions as early as the concept stage. By using Sherwin-Williams' FIRETEX® Design Estimator (FDE) software, complex fire calculations can be made for both cellulosic and hydrocarbon fire preparedness, while making it possible to calculate the exact quantity of intumescent coating needed to provide fire protection to a specifically sized steel section.

"Intumescent coatings are designed to expand when exposed to fire, forming a thick, insulating layer that helps to protect the underlying steel from the heat created," explained Bob Glendenning, FEET manager. "Depending on a building's design and structure, intumescent paint has the ability to protect steelwork for up to 120 minutes, as required by the designer and building regulations."

As it enters the final stages of construction, the new Danish Crown facility is due to begin production in late 2023 and will create around 300 specialised jobs once fully operational. Richard Melton of SDM Fabrication concluded, "Any food production environment must be built to the highest possible specifications to ensure the safety of those working in it. Sherwin-Williams has offered us a great deal of valuable advice and support in making sure that the building is protected from the potentially devastating effects of fire. As well as offering the highest levels of passive fire protection, FIRETEX® FX6002 is hardwearing, easy to apply and quick drying – qualities that make it a pleasure to use and ideal for this project."

FIRE PROTECTION

IN THE HEAT OF THE MOMENT

BY CARL BURRELL, REGIONAL MARKET DIRECTOR - FIRE, SHERWIN-WILLIAMS PROTECTIVE & MARINE

Intumescent coatings are a critical component of fire protection in modern construction. Carl Burrell, fire market director at Sherwin-Williams, explains how the latest innovations in this area provide an important line of defence.

Intumescent coatings play a pivotal role in safeguarding lives and property by offering highly effective passive fire protection. By slowing down the temperature rise in structural steel, they give occupants longer to evacuate and firefighters more time to respond.

EVERY SECOND COUNTS

Sherwin-Williams manufactures market leading intumescent coatings that are applied to the structural steel members used in the construction of modern buildings. These advanced coatings are designed to expand when exposed to high temperatures, forming a thick insulating layer that helps to protect the underlying steel from the heat of a fire, thereby delaying, or even preventing, structural failure and collapse.

An intumescent coating is applied to a thickness according to the level of protection required, and, if left untreated, has the appearance of typical decorative paint. For an intumescent coating to work, it needs space to expand when heated in order to form that protective layer.

There are several types of intumescent coatings available, each with their own unique properties and application methods. Therefore, it is important to engage with a coatings manufacturer as early in the design stage as possible in order to ensure that the most appropriate solution is used. Likewise, when working with an intumescent coating, it is important to follow the manufacturer's instructions carefully to ensure that it is applied correctly and provides the desired level of fire protection. Manufacturers can also provide training on the correct use and installation of these life safety critical coatings.

ASK THE EXPERTS

Although comprehensive specification information has made the selection process more informative and straightforward, the use of specific intumescent coatings can only be fully optimised if a building's entire fire protection requirement is calculated. Early-stage engagement and collaboration with the engineering team on a project can make all the difference and Sherwin-Williams has created its Fire Engineering and Estimating Team (FEET) specifically for this purpose. The unique blend of structural engineering experience and fire expertise within the team means that fire engineering support is available as early as conceptual design stage.

Just as importantly, Sherwin-Williams' FIRETEX® Design Estimator (FDE) software means complex fire calculations can be made for both cellulosic and hydrocarbon fire preparedness. FDE software can design fire protection thickness and volumes at the click of a button, making it possible to calculate the exact quantity of intumescent coating needed – saving valuable time and resources. It also has the capacity to deal with any type of steel section, in addition to creating designs based upon engineer's specified critical temperatures.

GAME CHANGER

Construction projects must be completed on time and on budget. Intumescent coatings traditionally take days to dry but Sherwin-Williams has redefined expectations with its FIRETEX® FX6002 and FIRETEX® FX6010 products. Designed to give the shortest possible time from application to handling for fire resistance periods up to two hours, they can be handled in as little as one hour, while providing a highly durable and aesthetically pleasing finish. These products have revolutionised throughput of steel structures and had a big impact on the critical timeline of project delivery.

As the leading ultra-fast drying and durable intumescent coatings, these FIRETEX® products are rapidly replacing traditional solvent based materials. This means a massive reduction in Volatile Organic Compound (VOC) emissions that may have adverse health effects and impact the environment. Just as importantly, its excellent mechanical durability minimises transport and erection damage, and resists the challenges posed by busy and congested construction sites.

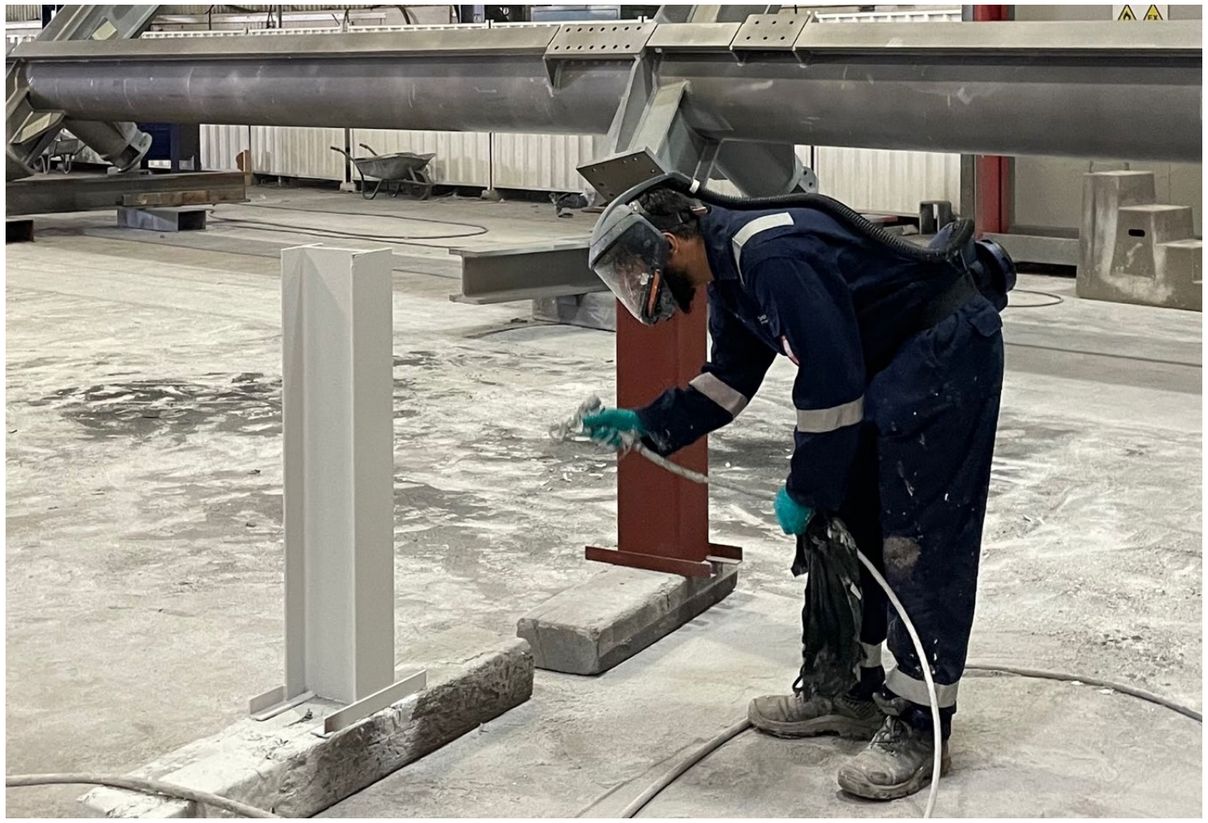
PRACTICE MAKES PERFECT

Intumescent coatings are integral to modern fire safety practices. Their ability to protect structures, ensure compliance with regulations, offer versatility and enhance cost effectiveness, all while prioritising life safety, underscores their significance. Property developers and owners, architects, builders and applicators must recognise the significant role these innovative products play in minimising the devastating effects of fires and prioritise their inclusion in any fire safety strategies.

ABOUT THE AUTHOR

With 21 years of industry experience, **Carl Burrell** has global responsibility for the Sherwin-Williams product portfolio strategy and implementation in the areas of passive fire protection (hydrocarbon and cellulosic fire) and cryogenic spill protection. He is a nominated BSI (The British Standards Institution) national expert on the International Organisation for Standardisation (ISO) TC67.

Contact: **Carl.Burrell@sherwin.com**



HIGH PERFORMANCE FLOORING

CAN A FLOOR COATING MAKE A BUILDING MORE SUSTAINABLE?

BY ADMIR AVDOVIC, PRODUCT MANAGER FLOORING – EMEAI, SHERWIN-WILLIAMS PROTECTIVE & MARINE

Sustainability must be far more than just a tick in the Environmental, Social and Governance (ESG) box if we are going to successfully address the climate crisis. Admir Avdovic, Product Manager Flooring EMEAI at Sherwin-Williams, looks at how innovative floor coatings are leading the drive towards more environmentally friendly and healthier buildings.

Although most organisations now recognise an obligation to operate as sustainably as possible, putting theory into practice is not always straightforward. Most traditional high performance protective floor coatings are petroleum or oil based, meaning that they cannot be considered sustainable products. However, the latest resin flooring systems are designed to deliver outstanding performance and utilise natural raw materials to bring a sustainable angle to these products.

SETTING THE STANDARD

Buildings can reduce their impact on the environment through sustainable design and construction practices. However, developing an effective environmental strategy can be a complex task, as creating a truly green building is only achievable by taking a joined-up approach to its entire infrastructure.

Two of the most well-known ratings systems for green buildings are Leadership in Energy and Environmental Design (LEED) and Building Research Establishment Environmental Assessment Method (BREEAM). They both set standards and measure the environmental performance of buildings including their construction, infrastructure and operation. Joining LEED and BREEAM are more than 100 other sustainability certification systems such as DGNB, Green Globes, Haute Qualité Environnementale (HQE) and Green Star.

MATERIAL GAIN

Floor coatings are being increasingly scrutinised, with regulatory authorities across the world focusing on how they are used for projects that involve upgrading existing floor finishes. The good news is that the latest protective coatings and flooring finishes can help designers, architects and specifiers achieve sustainability-based targets for their projects.

While UK standards require businesses to meet rigorous energy efficiency standards to lower consumption, directives proposed by the European Union (EU) will increase the annual rate at which buildings will be refurbished to control the level of new construction, contribute to efficient energy performance, and set minimum energy performance standards. This means that organisations will require affordable long-term flooring solutions with negligible waste creation and maintenance.

CONTENT PROVIDER

As well as contributing to the sustainability-based objectives of new building designs, the latest protective coatings and flooring finishes can also make them healthier environments.

One of the key performance criteria for flooring materials involves minimising the level of Volatile Organic Compounds (VOC) they contain.

Some leading manufacturers' floor coatings now feature low or no VOCs and are also free of toxic and carcinogenic ingredients – contributing to better air quality for building occupants. Independently verified laboratories confirm a product's emissions and this data can then be used to validate compliance to specific building certification schemes. This, in turn, allows a product to contribute towards LEED and BREEAM credits, and ultimately support a clean, breathable environment.

DOCUMENTARY EVIDENCE

One of the primary forms of documentation that can substantiate a product's sustainability-based credentials is an Environmental Product Declaration (EPD). EPDs highlight a manufacturer's commitment to measuring and reducing the environmental impact of its products and services and reporting these impacts in a transparent way. They play a crucial role in helping companies define their emissions minimum threshold and establish hotspots in project design.

EPDs allow the complete impact and performance of a product to be comprehensively evaluated. For example, floor coatings that are independently verified by NSF International, using ISO 21930 and ISO 14025, can count toward the credits needed to obtain sustainability certifications and contribute credits to LEED, BREEAM and other ratings systems.

FACTS AND FIGURES

The ISO 14025 Type III standard states that an EPD must use quantified product lifecycle information according to predetermined parameters in the form of a lifecycle assessment. Each individual EPD output is the quantity of product needed for the building lifecycle in kilogrammes and the resulting Global Warming Potential (GWP) in kilogrammes per carbon equivalent (kg CO_2e) for the product. An approved independent verifier then authorises the EPD before it is registered and published on the International EPD System.

Some manufacturers use a 'cradle to gate' method to construct an EPD, but it is advisable to work with one that adopts a 'cradle to grave' approach that evaluates a product from the time natural resources are extracted from the ground and processed, through each subsequent stage of manufacturing, transportation, use and, ultimately, disposal. This enables informed choices to be made during the design stage that support efforts to make a building more sustainable.

BIGGER PICTURE

Although a product's sustainable attributes are important, it also needs to complement a customer's needs in terms of strength, chemical resistance, cleanability and anti-slip performance. Aesthetic demands must also be considered. For example, many industrial building owners and managers now look at decorative options, as well as performance criteria, to create the most modern outcome. This contributes to staff welfare, production efficiency, and delivers the right impression to customers and visitors. Resin flooring systems meet these types of functional and aesthetic demands.

Modern flooring systems don't just offer 'rock hard' finishes designed as abrasion resistant harsh wearing surfaces. Flexible systems still have extreme durability and robustness yet retain a soft and comfortable finish that is modern and attractive for diverse applications. The finish is so tough it's suitable for industrial, commercial, and domestic facilities, while providing sound absorbing ergonomics that improve acoustic properties and reduce noise impact. These systems are also free of joints and seams, which can hide dirt and bacteria, and prevent the formation of cracks from vibration and heavy-duty wear.

RULES OF ENGAGEMENT

Sustainability has become a high priority when selecting products and manufacturing partners, and it's important to work with those that take a holistic approach to reducing their own carbon footprints, as well as those of their customers. Those that do this go beyond simply using more sustainable materials here and there, as they consider sustainability throughout the entire product lifecycle in addition to design, manufacture, and delivery. By partnering with a manufacturer that provides the right solutions and expertise, you can create a path to a more environmentally responsible building design.

ABOUT THE AUTHOR

With more than 13 years of experience with flooring products, **Admir Avdovic** has worked in Production, Customer Service and held positions of Area Sales Manager and Business Development Manager within the company. He is now responsible for the entire flooring products portfolio within EMEAI.
Contact: **Admir.Avdovic@sherwin.com**

STORING UP TROUBLE?

WHY STORING FEEDSTOCKS FOR BIOFUEL PRODUCTION PRESENTS DISTINCT CHALLENGES FOR THE SPECIFICATION OF TANK LININGS

According to the International Energy Agency (IEA), biofuel use is growing at around 6% a year and annual production was up 11% across the decade to 2017. However, storing the lipid feedstocks necessary to produce biodiesel, renewable diesels and sustainable aviation fuels presents significant challenges for refiners, according to tests conducted by linings and coatings expert, Sherwin Williams. To avoid the degradation of tank linings and the subsequent corrosion of storage tanks and contamination of feedstocks, it is essential that proper consideration is given to the particular requirements of storing these materials, including type of feedstock being stored, operating temperature and storage duration. Failing to do so risks material contamination, tank corrosion and even production delays.

THE GROWING IMPORTANCE OF BIOFUELS

Biofuels have an important role to play in decarbonising transport by providing a low-carbon solution for existing technologies, such as light-duty vehicles in the near term and heavy-duty trucks, ships and aircraft over the longer term. Indeed, according to the IEA, biofuel demand in 2022 reached a record high of 4.3 Exajoules (EJ) [170,000 million litres], surpassing levels last seen in 2019 before the COVID-19 pandemic. A significant increase in biofuel production is required to meet Net Zero Emissions (NZE) goals in 2050, and to meet the NZE scenario, biofuel production would need to reach over 10 EJ by 2030, requiring an average growth of around 11% per year.

Importantly, advanced feedstock usage would also need to increase to meet NZE by 2050: biofuels produced from waste, residues and non-food energy crops would have to meet over 40% of total biofuel demand by 2030, up from only around 9% in 2021 – a significant increase.

Increasing biofuel production presents one significant challenge for refiners, however: the lipid feedstocks required for biofuel refining have very different chemistries to fossil-based feedstocks, and it cannot be assumed that storage conditions - and the linings systems of storage tanks, in particular - are the same.

To understand the issues faced by biofuel producers, the leading global paint and coating manufacturer Sherwin Williams has conducted a series of tests that revealed significant degradation of tank linings over time and at certain temperatures, raising important questions for refiners about how they store the feedstocks necessary for biofuel production - and the temperatures to which they are exposed.

THE TESTING PROCESS

Sherwin Williams carried out a two-stage test under NACE TM-0174 Procedure B, with test temperatures of 71°C, 82°C and 93°C (based on project specifications) with evaluation at three monthly intervals extending to a minimum of 24 months.

The tank lining systems evaluated in Sherwin Williams' test included proven systems used in typical fossil fuel-derived feedstock storage applications: Solvent Free Epoxy Phenolic; Solvent Free Epoxy Novolac; and Novolac Vinyl Ester Glass Flake.

Feedstock media tested included a combination of waste cooking oil; waste cooking oil +1% water; beef tallow; and beef tallow + 1% water. It is reported that the presence of water accelerates the formation of free fatty acids, especially at higher temperatures.

TEST RESULTS (PHASE 1)

Under phase one of the tests, the impact of higher temperatures on the test samples was apparent at relatively short exposure times. The effects of higher temperatures on solvent-free Epoxy Phenolic (which is rated to 135°C in crude oil) were apparent at 71°C. The effects of higher temperatures on solvent free Epoxy Novolac (rated to 149°C in crude oil) were apparent at ~82°C. Both lining systems failed at 93°C.

Broadly speaking, subjecting lipid feedstocks to temperatures above 60°C results in the production of Free Fatty Acids (FFAs) in lipid feedstocks, and the tests again revealed lower limits for these same two linings, with resistance up to 71°C and degradation above this temperature.

Waste Cooking Oil + 1% Deionised water (DI)

Example at 71°C | Example at 82°C | Example at 93°C

TEST RESULTS (PHASE 2)

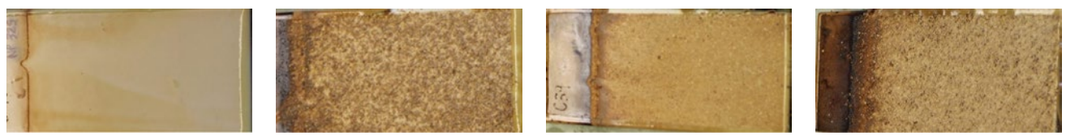
A second stage of testing involved two further elements: the examination of the oil composition and how it changes at different temperatures, and the expansion of feedstocks to simulate the conditions in the earlier (water cooking oil) tests.

Analysis of the oil composition revealed that, up to 60°C, vegetable oils remain reasonably stable with minimal degradation to FFAs after six months exposure. FFAs are thought to be the aggressive component behind degradation and this degradation accelerated at 71°C where the oil degrades to ~12% FFA content after six months of exposure. At 82°C the formation of FFAs is considerable (>30%). The degradation also appears to be time-dependent, with the FFA level increasing after only three months at temperatures higher than 71°C. This shows why there is no immediate breakdown and stresses the need for longer-term testing. The normal recommended duration as per NACE TM-0174 procedure B is 6 months.

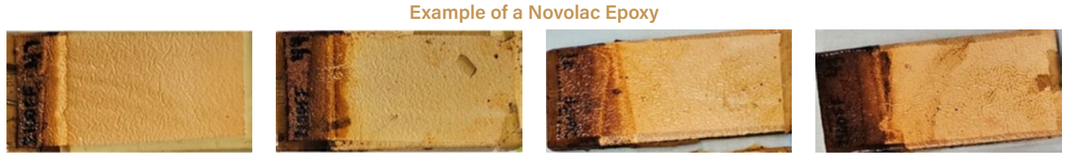
Expanding the feedstocks to simulate the conditions in the earlier (water cooking oil) tests involved the addition of oleic acid to simulate the conditions in the earlier tests, alongside an unmodified control. This revealed a correlation with the results seen for waste cooking oil and beef tallow under phase one when laced with an additional 5% FFA, although samples with higher levels of FFAs showed rapid degradation. Analysis of these modified oils by both time and temperature of exposure clearly showed that the presence of additional FFAs accelerated the degradation of the oil. Indeed, FFA formation grew faster under these conditions.

Testing on these oils demonstrates that, as anticipated, a Novolac Vinyl Esters system can handle the higher temperatures primarily due to the superior resistance to organic acids (such as the free fatty acids seen in renewable fuels). However, they present greater complications (flash point, storage stability etc.) during application.

Soy Oil + DI	Soy Oil + DI + 5% FFA	Soy Oil + DI + 10% FFA	Soy Oil + DI + 15% FFA



Example of a Novolac Epoxy



Example of a Novolac Vinyl Ester Glass Flake

CONCLUSION

As the provider of a range of linings proven to resist lipid feedstocks, Sherwin Williams undertook these tests to better understand the challenges that biofuel producers face when storing feedstocks that are very different from petroleum stocks.

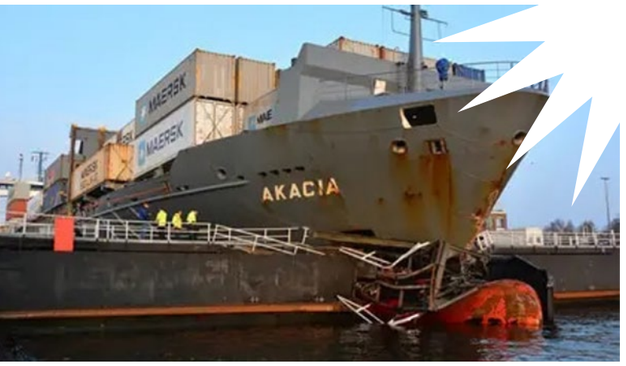
The tests clearly reveal the impact of both time and higher temperatures on tank linings and the negative impact this has on feedstocks, with lining degradation, tank corrosion and feedstock contamination all increasing as temperatures rise, resulting in high FFAs in these feedstocks. Higher rates of FFAs then appear to accelerate degradation. The result is considerable refinement challenges for producers as they seek to increase biofuel production.

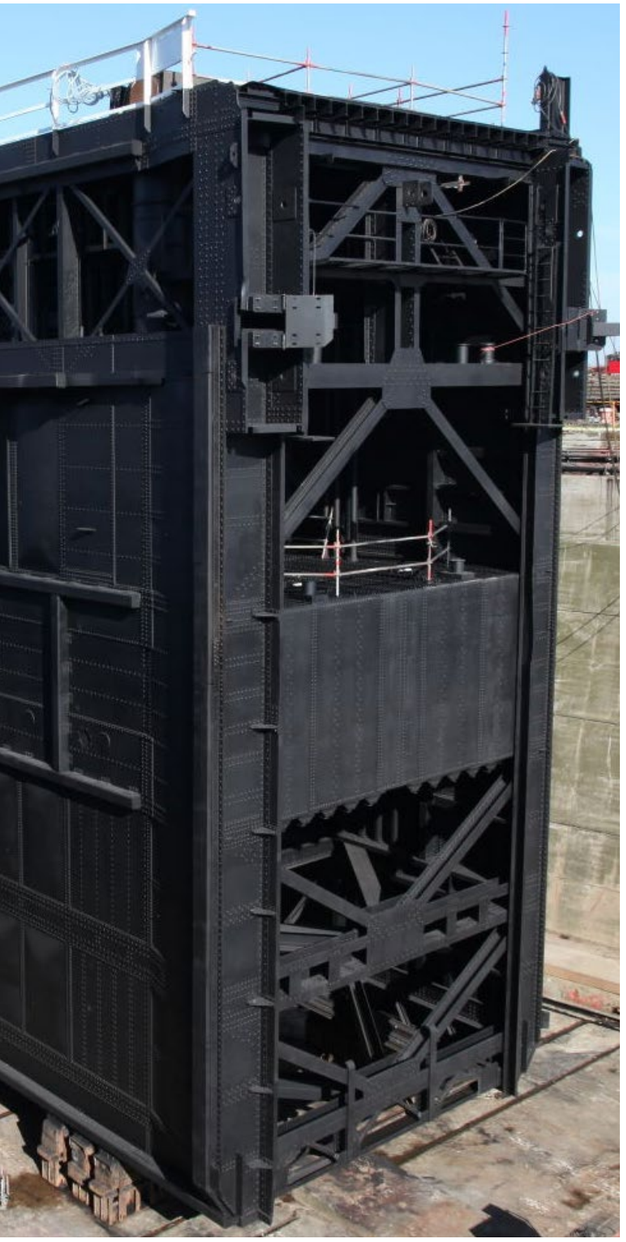
It's important to note that the tests do not call into question NACE TM-0174 Procedure B as the relevant test for these types of feedstock, but the results do raise the question of whether a test duration of six months is sufficient. Longer test periods might be required to gain a more complete understanding of the impact of storing lipid fuel stocks on tank linings.

With biofuel production on the rise and set to grow further as it takes a central role in meeting net zero ambitions, understanding the best practice for lipid feed stock storage is vital. Producers need to be very clear about their storage processes, the temperatures which their feedstocks will be subjected to, and the duration they will be stored. Above all, the exacting demands placed on those storing and handling feedstocks (very different to petroleum ones) must be acknowledged, and the test results show that talking to an expert early on when specifying tank linings for lipid feedstock storage is essential first step for biofuel producers.

Reference: IEA, Tracking Clean Energy Progress Report, July 2023, accessed at https://www.iea.org/energy-system/low-emission-fuels/biofuels

Mahmood Ebadian, Susan van Dyk, James D. McMillan, Jack Saddler, Biofuels policies that have encouraged their production and use: An international perspective, Energy Policy, Volume 147, 2020, 111906, ISSN 0301-4215, https://doi.org/10.1016/j.enpol.2020.111906.





SHERWIN-WILLIAMS HELPS TO REPAIR A LOCK GATE AT THE NOK, FOLLOWING AKACIA COLLISION

When a malfunction aboard the container feeder Akacia caused it to strike a 110-year-old lock gate at the Baltic Sea entrance of the NOK (North Sea-Baltic Sea Canal), it caused extensive disruption and significant damage. Once repairs to the steelwork had been completed, Sherwin-Williams was tasked with providing a coating that would restore the lock gate to its former glory.

On 19th February 2018, the Portuguese flagged container feeder Akacia was on its way from Bremerhaven to St Petersburg and preparing to enter the Neue Südschleuse in order to exit the NOK. However, eyewitness reports indicated that the ship suddenly accelerated as it approached the lock gate, reaching a speed of around nine knots. The ship's master dropped both anchors in an attempt to slow down, but couldn't stop the 149m, 11,000 Gross Register Tonnage (GRT) vessel from striking the lock gate.

CAUSE AND EFFECT

The ship's hull was breached and it suffered minor water ingress from the collision, but it was possible to detach the damaged vessel from the lock gate with the help of a tugboat. Since the damaged lock gate was unable to adequately seal the chamber, the water level rose to that of the Baltic Sea and the ship could only leave the lock chamber when the water level had stabilised.

"Once the vessel had been moved, it was clear that the lock gate had sustained serious damage, with repair costs estimated at several million Euros," explains Axel Petrikat, marketing product manager at Sherwin-Williams. "Before work could begin, the steel debris had to be removed by divers. It was a dangerous operation, as any movement to the metal at the bottom of the lock could have caused the entire structure to collapse. Due to meticulous planning, the operation was carried out successfully and a detailed assessment of the damage was carried out, with surveys completed prior to the removal of the lock gate to a shipyard in Kiel for repair."

ASK THE EXPERTS

The repair work was extensive and had to take into account a number of factors – not least of all the age of the lock gate. At 110 years old at the time of the accident, it was constructed using riveted steel with thousands of steel bolts, while the steel quality itself was different to that which would be used today. This made corrosion protection difficult to implement, so extensive blast cleaning measures were necessary, with the blasted debris and old coatings collected and specially disposed of due to their toxicity.

The steelwork took almost two years to complete and during this time Sherwin-Williams was approached by the Federal Waterways Engineering and Research Institute (BAW), the Federal Waterways and Shipping Administration (WSV) and the Waterways and Shipping Office (WSA) to carry out a full complete corrosion protection coating project on the

lock gate. Sebastian Fluegal, Area Sales Manager, FROSIO Inspector Level III: 4154, at Sherwin-Williams, comments, "We have worked extensively with the WSA Kiel-Holtenau over the last 18 years to provide coatings across the estate for new construction and renovation projects. Thanks to this experience, we were ideally placed to configure a solution using our range of high-performance products."

SOLUTION PROVIDER

Sherwin-Williams produces durable, long-lasting coatings that boast extended lifecycles, minimising the need for steelwork replacement – qualities that are especially beneficial in environments like lock gates or port installations. Once the new steelwork was in place, Sherwin-Williams and its approved applicator spent 18 months ensuring that the lock gate coating was completed to the highest standards.

The project comprised a total coating surface area of 18,000m^2 and when asked to outline the products used, Sebastian Fluegel replied, "We applied one 70 micron coat of Zinc Clad® R, which is a highly pigmented zinc rich primer based on epoxy resin. Importantly, it has a low solvent content according to the Protective Coatings Directive of the German Paint Industry Association. This was followed by two 250 micron coatings of Dura-Plate® Poxicolor SW N, our abrasion-resistant epoxy resin coating with a low solvent content and sustainable curing component. Finally, for the atmospheric loaded upper areas of the gate, a 80 micron coat of Acrolon® EG-5 added another layer of corrosion protection and an aesthetically pleasing finish."

SUCCESS STORY

Frauke Schmidt, project manager at the WSA Kiel-Holtenau, is delighted with the completed work and concludes. "Obviously, accidents like this are fortunately rare. That said, the damage to the lock gate was extensive, so we required partners of the highest calibre in order to restore it and make it fully operational again. Sherwin-Williams' support throughout the process was invaluable. Thanks to its industry-leading products, we now have a lock gate with a coating that offers the best possible protection against damage and corrosion."

TANK LININGS

PREVENTION IS BETTER THAN CURE

BY MICHAEL HARRISON, GLOBAL PRODUCT DIRECTOR – LININGS,
SHERWIN-WILLIAMS PROTECTIVE & MARINE

Storage tank linings are designed to withstand chemical resistance, high temperatures and high pressure, as well as mechanical abrasion. Michael Harrison, global product director for linings at Sherwin-Williams, explains the importance of using the correct lining and how working with an expert manufacturer can ensure state-of-the-art application and inspection support.

The need to maintain the structural integrity of large industrial storage tanks sounds like a no-brainer. It certainly should be, yet all too often they are left to deteriorate due to a failure to use the correct lining and/or carry out regular maintenance. The cost implications of having to take urgent and unplanned action to stop leaks and ensure storage tanks are structurally sound can be extremely costly, while fines for breaching environmental and health and safety legislation are significant. In 2017 a major UK retailer was fined £8m after pleading guilty to a petrol leak from one of its filling station storage tanks, which saw 23,500 litres of petrol seep into the sewerage system and local rivers.

MATERIAL GAINS

Storage tanks are used to hold a variety of commodities including water, wastewater, oil, petroleum products, chemicals, and food products. Although glass reinforced plastic, thermoplastic and polyethylene tanks are gaining popularity, most storage tanks are constructed from concrete and steel – a material that is susceptible to corrosion attack. Without the proper protection mechanisms in place, steel tanks will naturally corrode in vulnerable areas through cracking and pitting, which is a form of localised corrosion.

There are instances where owners simply choose not to line their storage tanks – thinking short-term about the initial outlay of cost, rather than the long-term savings this action will generate. Others will change the contents of a tank without carrying out a full inspection to ascertain whether the existing lining is suitable or fit for purpose. Even storing similar materials can lead to complacency. For example, the recent move to E10 petroleum from E5 means that tanks are exposed to higher levels of ethanol, which can cause degradation of inferior linings and steel welds in tanks.

FORWARD THINKING

A typical 30m diameter tank will contain more than 7 million litres of fluid which can represent a massive financial outlay. It therefore makes sense to put in as many measures as possible to protect them in order to maximise any return on investment. Although the standard inspection and maintenance period of storage tanks is 10 years, this might not be enough if the correct lining isn't used in the first instance.

It's important to remember that there is no 'one size fits all' when it comes to storage tank linings. The best solution will depend on several factors including – but not limited to – the chemical being stored (and its purity), the condition of the substrate in the tank, and the conditions during its application.

Storage tank lining is a highly specialist area, so getting it right first time is vital. Working with a manufacturer that has a technical service team that understands the customer's needs now - and in the future - will ensure that the right questions about substrate composition and condition, exposure conditions, chemicals present and in what concentrations, as well as the temperature and pressure data, are considered in advance.

A DESIGN FOR LIFE

To maximise the operational life of storage tanks, the protective coatings sector has focused on the use of long-life, high-performance linings to reduce internal corrosion. Cutting edge solutions are solvent free, which not only makes it safer for those applying the linings, but also reduces the number of coats required. Similarly, as there isn't any solvent in the coatings there is nothing that may lead to breakdown over time.

Being able to ensure the quality of the lining application by pinholes, resolve missed areas and ensure uniform coverage, optimises the effectiveness of the lining. To facilitate this, linings have been developed that use a fluorescing pigmentation for instant verification of missed areas under eye-safe ultraviolet light. This allows linings to be inspected during application to create a high-quality finish with minimal downtime, improves productivity of coating inspection and extends the service life of the coating by ensuring correct film thickness is achieved.

SUPPORT STRUCTURE

Supply chain issues have meant that safely and securely storing commodities is vital to the global economy. Therefore, the role of storage tanks should not be underestimated. Making the right decisions when it comes to selecting storage tank linings can address product performance and life expectancy, meet health and safety requirements, and assist with technical servicing.

ABOUT THE AUTHOR

Michael Harrison's coatings industry experience includes more than 30 years in the development and support of linings in all protective segments with a specific focus on the oil and gas, mining, power generation, and water and wastewater markets. Currently, he supports the global business offering for protective tank and pipe linings for terminal and refinery installations in the oil and gas market, among other markets. Michael has met the requirements of the Coating Inspector Program (CIP) Level 2 Certification from NACE International and has presented at a variety of coatings conferences. He has a degree in applied chemistry from Northumbria University.
Contact: **Michael.Harrison@sherwin.com**

CORROSION PROTECTION

DURABLE FIRE AND CORROSION PROTECTION OF STEEL BRIDGES

BY JOACHIM PFLUGFELDER, PDM MANAGER,
SHERWIN-WILLIAMS PROTECTIVE & MARINE

A key component of transportation infrastructure for centuries, bridges play an important role in keeping our roads, railways and footpaths connected. Joachim Pflugfelder, project development manager at Sherwin-Williams, explores how correct coatings selection and application methods can overcome complex project challenges and reduce a bridge's lifecycle costs.

Bridges have been part of our infrastructure and of cultural importance for centuries, and they will continue to be important for a mobile society in the future. However, with an average life of 100 years, bridges require considerable investment - not only in construction, but also in their lifecycle costs. The latter usually exceeds the cost for the original construction of the structure by a factor of one and a half.

The lifecycle cost of bridges also includes the maintenance of the coating systems that protect the steel from external influences. For economic reasons, it is advisable to use technologically high-performance systems for this, in order to ensure long-term functionality. This applies particularly to steel bridges, as compared to concrete as a construction material, the lighter steel can be used to build slender bridges that can span larger distances. However, steel is susceptible to corrosion and loses its load-bearing capacity in the event of a fire at a critical temperature of approx. 500°C.

Corrosion protection of steel bridges has been used for decades to ensure durability and for economic efficiency, and this technology has been continuously developed based on the experience gained. Fire protection coating systems, on the other hand, are not usually required for steel bridges. However, due to the design, or possible fire hazards in the immediate vicinity, some of these structures also need to be protected, in addition to corrosion protection. Coating systems that provide corrosion protection and at the same time protect the steel from rapid heating in the event of a fire, are an economical solution. This saves valuable time until the critical temperature is reached, and the load-bearing capacity is lost. These innovative 2-component epoxy systems have been tested in accordance with the current standards, have been tried and tested in practice for over ten years, and are state of the art. They are a technologically advanced and economical method of maintaining the functionality of steel bridges safely, and in the long term.

The requirements for fire protection and corrosion protection of steel components for bridge construction are increasing and covered by different standards and specifications.

The service life of steel bridges is estimated at 100 years. Innovative 2-component epoxy coating systems enable economical and long-term protection of these structures.

The 2-component epoxy fire protection coatings, only a few millimetres thick, preserve the filigree structures of steel bridges in case of fire. Due to their insignificant weight, intumescent coatings have no influence on structural calculations.

BAD VILBEL MUNICIPAL LIBRARY

The municipal library in Bad Vilbel, Hesse, is the first bridge structure that is both a pedestrian bridge and a library. The modern structure is part of the large-scale redesign of the city centre, and extends over the banks of the river Nidda, which has been re-naturalised in this area. For the fire protection of the main supporting structure, which was designed as a truss construction, the protection class R90 was required, and for the corrosion protection, category C3. The fire and corrosion protection coating FIRETEX® Platinum applied in the factory easily withstood the extreme mechanical loads during the construction phase caused by heavy goods traffic, varying weather conditions, rain, snow, ice, condensation and temperature changes. The patina that had built up due to this natural weathering could be easily removed with a high-pressure cleaner without affecting the coating.

The municipal library in Bad Vilbel meets the fire protection class R90 and in corrosion protection the category C3. The factory-applied FIRETEX® Platinum coating easily withstood the extreme mechanical loads and weather conditions during installation and has remained intact for ten years.

FIRE PROTECTION FOR STEEL BRIDGES

Fire protection coatings for steel structures are systems that react chemically when exposed to temperature in the event of a fire and can protect steel components from failure for a specified period of time. In a fire, unprotected steel structures deform when exposed to temperatures of approx. 500°C, thus losing their load-bearing capacity and collapsing. Unprotected steel components reach this critical temperature after only about five to ten minutes, depending on their profile and wall thickness.

Reactive fire protection coatings are tested to DIN EN 13381-8 and classified according to DIN EN 13501-2 in the fire resistance classes R15 to R180. According to the Guideline for European Technical Approvals for Fire Protection Products ETAG 018-2, and the Export Accompanying Document (EAD), the use of fire protection coating systems can be confirmed via a European Technical Assessment, the so-called ETA assessment. In addition to this approval document (ETA), in Germany the General Construction Type Approval of the German Institute for Construction Technology (DIBt) regulates the applicability of this construction type in terms of the state building regulations.

Currently, all system manufacturers test their reactive fire protection coating systems according to DIN EN 13381-8, so that their application is based on a European Technical Assessment (ETA) and a General Construction Type Approval (AbG). Depending on the critical steel temperature, between 350°C to 750°C, the profile shape, and the U/A value, the ETA regulates, among other things, the film thickness required to achieve the designated fire resistance duration of up to 180 minutes.

ARNULFPARK PEDESTRIAN BRIDGE

For the pedestrian bridge over the Arnulfpark in Munich, the requirement for corrosion protection was an approval according to ZTV-ING Part 4, Section 3, Sheet 87. For fire protection, the fire resistance class R90 had to be met, as there is a coach wash for ICE trains under the steel bridge. The corrosion protection and fire protection coatings were applied in the factory. Macropoxy® EG was used for corrosion protection and FIRETEX® Platinum for fire protection, the ETA made an approval in individual cases superfluous. On site, the steel components were then welded, coated, and moved longitudinally in cycles, and areas damaged from moving were repaired or recoated with FIRETEX® Platinum. For cosmetic reasons, the entire construction was finally given a complete top coat.

The pedestrian bridge over the Arnulfpark in Munich is coated with FIRETEX® Platinum and fulfils the fire resistance class R90. Approval in individual cases was not necessary, as the proof of ETA is available.

Image: Holzherr und Gössing | Architectural Documentations

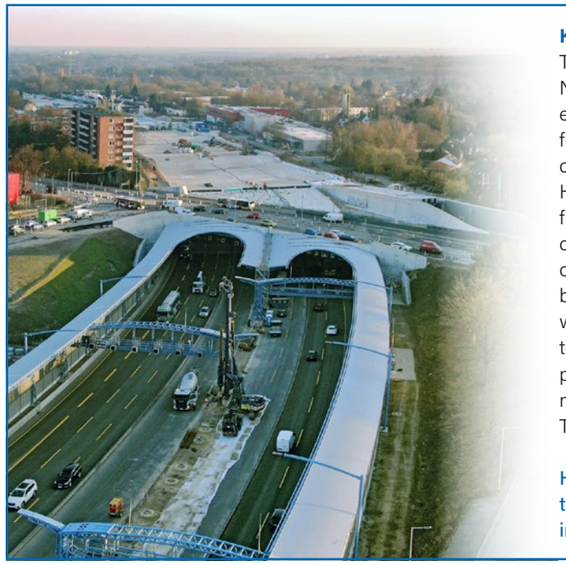


Image: DEGES I Hajo Dietz; Nuemberg Luftbild

KIELER STREET BRIDGE

The A7 federal motorway was widened from the Hamburg-Nordwest junction to the Bordesholm junction by up to six or eight lanes. The old steel Kieler Straße bridge in Stellingen, functions as the entrance and exit of the city tunnel, the so-called Hamburger Deckel, and could be retained unchanged. However, the steel bridge soffit and the bridge box had to be fire-protected to fire resistance class R60 on site, as a lorry or car fire under the bridge could otherwise lead to the collapse of the structure. Likewise, the steel supports and the traffic sign bridge at the portals were protected against fire and corrosion with 2-K epoxy fire protection intumescent, and blue cosmetic top coat. At the same time, the fire protection coating was to protect the structure against moisture and de-icing salts, and meet the requirements of category C5 for corrosion protection. Therefore, FIRETEX® Platinum was used.

The old steel bridge Kieler Straße (Kieler Street) in Hamburg-Stellingen had to be fire-protected due to the expansion of the A7 motorway. With our 2-K epoxy intumescent, it is now protected against fire and corrosion.

ABOVE AND BEYOND THE REQUIRED SERVICE LIFE

The period of ten years for fire protection defined so far in an ETA is based on an assumed service life for the intended use of ten years, and is a theoretical value set by the Commission which has nothing to do with the actual service life and durability of intumescent coatings. This period should be understood to be more as a revision period, after which the fire protection coating must be checked for damage and defects. However, the periods described in the ETAs are changing. Currently, there are ETAs with service lives of more than 25 years, whereby a distinction must be made as to whether the approval of the coating was granted for interior or exterior use.

LONG TERM CORROSION PROTECTION

For corrosion protection, longer and longer protection periods are becoming required, e.g. in the current DIN EN ISO 12944 standard, this is more than 25 years for steel structures. For steel bridges, there are even higher requirements in Germany, as a service life of 100 years is calculated to be twice as long as for steel buildings. In addition, de-icing salt is used on bridges in winter. Therefore, the new ZTV-ING Part 4, Section 3 from March 2021 provides for a calculated protection period for coating systems of 50 years. This is possible because the manufacturers of coating systems are continually working on the further development of their products and systems.

The corrosion protection coating of a steel bridge according to DIN EN ISO 12944 must be partially or fully renewed three times within this lifecycle, given an imputed service life of organic coatings of 25 years and a service life of the structure of 100 years. The imputed service life of the coating according to Sheet 87 of ZTV-ING Part 4, Section 3 is 33 years, so that partial, or full renewal, only has to take place twice during the service life.

MODERN HIGH PERFORMANCE COATING TECHNOLOGIES

For more than 50 years, steel structures have been effectively protected by 1-component intumescent coatings to maintain their stability for longer in case of fire. The intumescent coatings react under the influence of heat to form a foam layer centimetres thick. This barrier prevents heat from being transferred to the steel. The advantages of 1-component intumescent coatings are low layer thicknesses, easy application and almost unlimited processing times at low cost.

However, their use on the construction site is considerably limited, as they have to be applied in several layers, which prolongs the through-drying time accordingly. In addition, 1-component intumescent coatings have low mechanical strength, and their useful life of 25 years is limited to interior applications. Unfavourable environmental conditions on site can additionally limit their use considerably. As a result, the coating work cannot keep up with the pace of other construction measures and thus delays the overall project progress.

Due to this, the factory application of intumescent coatings has been further improved in recent years. However, there are now also numerous fast-drying 1-component products on the market. Nevertheless, through-drying and the risk of damage during transport and installation on the construction site continue to cause problems. Necessary rework on site is time-consuming and largely negates the advantage of the time saved in the factory.

Fast-drying, solvent-free, epoxy resin-based formulated 2-K fire protection coatings are usually applied directly in the factory because they are more robust than 1-K products. However, they can also be applied under controlled climatic conditions on the construction site. Currently there is a range of 2-K epoxy coatings available offering different properties. FIRETEX® Platinum technology, in contrast to other 2-K coating systems, is very resistant and can thus withstand extreme weather conditions and de-icing salt. The additional decisive advantage of this new generation of intumescent coatings is that in addition to fire protection of the structure, they also provide corrosion protection, according to DIN EN ISO 12944-5 up to C5 very high, as well as meeting the requirements of ZTV-ING Part 4, Section 3.

THE FUTURE OF STEEL BRIDGE COATINGS

In steel bridge construction, there are more than 45 years of experience with epoxy and polyurethane resin-based reactive systems. Innovative coating systems in accordance with the new Sheet 100 of ZTV-ING Part 4, Section 3 enable a protection period against corrosion of at least 50 years with a total coating thickness of 400 microns. In the future, a steel bridge will only have to be repaired once during its service life of 100 years. The first projects based on this principle are already in production or planning. For example, a tram bridge over a recycling centre with tyre storage, will be coated with a system that not only guarantees extremely high corrosion protection but also fire protection up to fire resistance class R120.

ABOUT THE AUTHOR

With over 40 years' experience of studying and working in the corrosion protection business, **Joachim Pflugfelder** headed up various departments at Sika in Stuttgart until Sherwin Williams acquired the corrosion protection division in March 2022. Since then he has managed the Project Development Department for corrosion and fire protection at Sherwin Williams.
Joachim has been chairman of the corrosion protection committee in the paint association since 2002 and, for more than 20 years, he has been working in various DIN-standardisation and corrosion protection groups and committees of the German infrastructure.
Contact: **Joachim.Pflugfelder@sherwin.com**

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