



COATINGS AND ANTI CORROSION ENGINEERING REVIEW

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Urbanization, infrastructure development to spur growth for waterproof coatings



Interview
Dr Bijal Sanghvi
Director, Axis Solutions Pvt Ltd.

Technical Feature
**Protection of underground
pipelines by coatings**



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Editor-in-Chief

Jolly Lonappan
editor-in-chief@coatingsjournal.com

Publisher

Franco Lonappan
publisher@coatingsjournal.com

Editor

Abraham Mathai
editor@coatingsjournal.com

Subscriptions

Vitthal Talekar
M: 8879050769
marketing@coatingsjournal.com

Design

Narendra Tipnis

Administration

Chhaya Kapadia

Accounts

Aatish Shedje

Office

Jerome Quadras

Editorial, Advertising and

Circulation Office:

102, Dattar Mansion, C. S. Marg, Vakola
Bridge, Santacruz (East), Mumbai 400055
Tel: (022) 26680477, Tel/Fax: 26684376
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From the Editor-in-Chief...

After water, concrete is the most widely used material on earth. Approximately 4.3 billion tons of cement – the principal ingredient in concrete – were produced in 2021.

According to a report by Future Market Insights, Inc, the global waterproof coating market is set to thrive at a CAGR of 4.02% between 2022 and 2032 while holding a value of US\$15.81 billion in 2022. The anticipated value is US\$23.45 billion by the year 2032.

Waterproof coatings are expected to grow significantly in the coming years due to their increasing demand across various industries. As a result of the increasing population and rapid urbanization, waterproof coatings have become more popular around the world, which will aid in the growth of the market. In addition, the increased commercial and residential infrastructure around the world is expected to result in a rise in demand for waterproof coatings and thereby drive growth in the market.

Waterproofing is essential because concrete can corrode. Concrete corrosion happens when concrete breaks down due to exposure to corrosive substances. This can happen when concrete which is alkaline in nature is exposed to sulfur compounds, salty or acidic water, chlorides, microbes, nitrates, fluorides...

Concrete corrosion can be dangerous because concrete is porous, allowing corrosive materials to soak in and cause damage from within. It can also weaken the structure of reinforced concrete, as the steel bars that provide strength can corrode as well.

In this issue, we discuss how waterproofing methods can assuage the problem to an extent possible.

Plus, also all our regular columns, news, case studies and features.

Let me also take this opportunity to wish you all a great festive season!!!

Jolly Lonappan
Editor-in-Chief



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CORROSION, ABRASION & CHEMICAL ATTACKS destroy crores of rupees worth equipment every year. Worldwide research shows that nearly 70%-80% equipment failures are purely due to their surface erosion. The need for effective preventive maintenance therefore is imperative.

The time has arrived for ceramics to finally take centre stage. Jyoti Ceramic Industries has specially developed ceramic filled polymer based coating compounds, "Aluma Coat® -BR" brushable / sprayable and "Aluma Coat® -TW" trowelable.



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Aluma Coat - BR

Aluma Coat® - BR

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E-mail: info@jyoticeramic.com
Web: www.jyoticeramic.com

Europe
Jyoti Ceramic GmbH
Frankenstr. 12, 90762 Fürth, Germany.
Tel.: +49 (0) 911 78 71 20 83 / 84 / 85
Fax: +49 (0) 911 78 71 20 82
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PPG launches PPG PITT-THERM 909 spray-on insulation coating for oil and gas, infrastructure industries

PPG has announced the launch of the PPG PITT-THERM® 909 spray-on insulation (SOI) coating. This silicone-based coating is designed for high-heat environments in the oil and gas, chemical, petrochemical and other critical infrastructure industries, where it provides improved safety, asset protection and operational efficiency compared to traditional thermal insulative materials, notes a press release from the company.

Conventional waterborne acrylic or epoxy-based SOI coatings cannot be used on equipment operating above

customers. It can be applied in thicknesses of up to 250 mils (6.35 mm) per coat and depending on the specific application requirements, only one or two coats are needed, substantially cutting down the time and cost of the insulation process. Despite the reduced number of layers, it can achieve a higher total coating thickness of up to 500 mils and cure times are comparable to competing products.

Application to both hot and cold substrates is also viable, allowing assets to remain in service during application – a significant advantage over traditional methods that require operational shutdowns.



PPG announces PPG PITT-THERM® 909 spray-on insulation coating, designed for high-heat environments in the oil and gas, chemical, petrochemical and other critical infrastructure industries.

350°F (177°C). Silicone-based PPG Pitt-Therm 909 coating offers much greater temperature resistance; thermal testing shows that it endures continuous and cyclic temperatures as high as 500°F, and by reducing heat transfer, external surfaces remain safe to touch at up to 310°F, significantly reducing the risk of burns.

Application testing of PPG Pitt-Therm 909 coating has also shown that fewer coats are necessary compared to traditional SOI coatings, providing operational efficiency benefits for

customers. It can be applied in thicknesses of up to 250 mils (6.35 mm) per coat and depending on the specific application requirements, only one or two coats are needed, substantially cutting down the time and cost of the insulation process. Despite the reduced number of layers, it can achieve a higher total coating thickness of up to 500 mils and cure times are comparable to competing products.

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AkzoNobel develops particle technology for sustainable metal effect powder coatings

Rising customer demand for more sustainable metal effect architectural finishes has prompted AkzoNobel to develop patented particle technology for a new range of powder coatings.

Having identified a clear market need, scientists at

Development Director at AkzoNobel's Powder Coatings business.

“With this new offering, we're enabling architects and designers to not only reimagine how they can create a stunning metallic effect finish, but are also

addressing their desire for a more sustainable world by overcoming the cost and practical handling considerations of using real metal.”



The new collection features patented stabilized particulate technology which results in a more concentrated, deeper metallic finish than conventional metallic powder coatings.

Designed to protect and enhance even in the most challenging environments, the new range features a broad

palette of superdurable on-trend finishes, from copper, brass, steel and nickel through to silver and iron.

As with all Interpon products, it contains no volatile organic compounds (VOCs) and is more sustainable in application, since any overspray can be captured and reused, leaving virtually zero waste.

It's the latest in a series of recent innovations from AkzoNobel's Powder Coatings business, which have included the company's first single layer powder coating for two-wheelers (Interpon A300) and an industry-first architectural powder coating which can be cured at temperatures as low as 150°C (Interpon D1036 Low-E and Interpon D2525 Low-E).

the company's Powder Coatings business have created the Interpon D Natural Metals range. It has all the aesthetic beauty and durability that architects and designers are looking for – offering spectacular color and performance – but with none of the drawbacks of real metal, notes a press release from the company.

The new collection features patented stabilized particulate technology which results in a more concentrated, deeper metallic finish than conventional metallic powder coatings.

“Our scientists and expert team of color specialists are at the forefront of innovation and creative excellence and are constantly working with and for our customers,” says Frank Vergeer, Research &

repellent PPG Pitt-Therm 909 has demonstrated exceptional corrosion resistance in rigorous testing. Results show that it is an optimal solution

for CUI prevention for reduced maintenance costs, operational shutdowns and safety incidents, the press release notes.



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BASF Coatings launches first ChemCycling® products in the automotive refinish market

BASF Coatings (basf-coatings.com) has introduced new product lines for the automotive aftermarket. Further driving sustainability in the refinish industry, BASF's next generation of clearcoats employs the company's unique ChemCycling technology. The product lines, manufactured using recycled feedstock, are marketed under BASF's premium brands Glasurit and R-M and will boost body shop efficiency and productivity. The products not only contribute to the circular economy but also reduce CO₂ emissions, notes a press communique from the company.

waste," said Chris Titmarsh, Senior Vice President, Global Automotive Refinish Coatings, BASF.

Leveraging BASF's ChemCycling technology, recycled feedstock derived from waste tires is used to create certified Cycled® products, effectively diverting them from landfills or incineration. The recycled feedstock is attributed to the certified Cycled clearcoats through a mass balance approach: BASF Coatings' Glasurit AraClass A-C-24 Eco Balance and R-M Race Finish-R eSense clearcoats are the first automotive refinish products that utilize this



BASF Coatings has introduced new product lines for the automotive aftermarket at Automechanika, Frankfurt 2024.

"At BASF Coatings, we're always pushing what's possible, empowering body shops to lead the change with sustainable technologies that are unique to the market. With our exclusive ChemCycling, our vision is to support a circular economy by reducing the use of fossil raw materials, minimizing waste and cutting CO₂ emissions in the value chain. We're here today making a difference with our new products, replacing a share of the fossil resources with recycled feedstocks, and that is a huge step towards less environmental impact, less emissions and less

technology, delivering benefits to both body shops and the environment.

Additionally, the products bring further benefits: The clearcoats' drying speed allows for fast processing, with the coating drying in just 20 minutes at 40°C. By reducing drying time, energy consumption is significantly lowered, resulting in improved efficiency and reduced environmental impact. This feature is particularly advantageous for electric vehicles, as it minimizes their exposure to excessive heat.

Ensure compliance and consistency with GARDCO's new certified Gel Timers

Paul N. Gardner (GARDCO USA (gardco.com), a global leader in manufacturing and distribution of physical testing and inspection instruments for the paint, coatings, and related industries, has introduced its brand-new line of Certified GARDCO Precision Gel Timers.

The GARDCO Gel Timers come in standard or heated models with or without certification. Certified models are thoroughly tested and calibrated to meet industry standards, and each comes with a factory certificate verifying the gel timer's reliable performance in research, development, and production settings, notes a press release from the company.

These gel timers are CE-certified and designed to enhance the accuracy and consistency of gelation tests across a wide range of materials, including resinous plastics, epoxy resins, adhesives, drying oils, FRP, two-component elastomers, and paints. Built for user-friendly operation, they deliver unmatched precision for both room-temperature and elevated-temperature testing.

James Fusco, Product Manager at Paul N. Gardner Company, remarked: "The new certified Gel Timers offer tremendous value to global markets by ensuring that the gel timer has been tested and calibrated to meet industry standards leading to more accurate and consistent gel time measurements."

The Gardner GT – Certified Standard Model Gel Timer is a simple device designed to



Built for user-friendly operation, the GARDCO Gel Timers deliver unmatched precision for both room-temperature and elevated-temperature testing.

determine gelation time for samples at ambient temperature. It delivers accurate and repeatable measurements of gel time applications for samples that are measured at ambient temperature.

The Gardner GT-H – Certified Heated Model Gel Timer delivers accurate and repeatable measurement of gelation time, it can be used for ambient temperature applications along with the added feature of a precision heating element that enables the user to accurately control temperature of a sample, the GT-H has a heating range from 125°F to 425°F (51°C to 218°C).

Designed, engineered, and manufactured by GARDCO, these gel timers feature an upgraded interface with a digital readout and broad temperature control, ensuring exceptional reliability and ease of use. Built for rigorous daily operation, they meet global requirements without the need for complex setups or additional tools.

With advanced technology, durable construction, and simple operation, GARDCO's new Gel Timers offer quick, reliable, and precise gelation testing at an affordable price.

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Defelsko's PosiTector 6000: Advanced coating thickness gage for all metal substrates

The Defelsko's PosiTector 6000 is a robust, fully electronic coating thickness gage, designed for precise measurement on ferrous and non-ferrous metals. Using magnetic induction and eddy current principles, it delivers fast, accurate paint thickness

PHOTO: DEFELSKO



Defelsko's PosiTector 6000 is a robust, fully electronic coating thickness gage, designed for industries like automotive, marine, and construction, where consistent coating thickness is critical for durability and protection against corrosion.

readings without the need for calibration adjustments in most applications. It's the go-to choice for industries like automotive, marine, and construction, where consistent coating thickness is critical for durability and protection against corrosion, notes a product write-up.

Features include standard mode measurement speed of 60+ readings/min and fast mode of 90+ readings/min; USB, WiFi, Bluetooth 4.0 connectivity for seamless data transfer; storage capacity of 1,000 readings per probe in standard model and 250,000 readings across 1,000 batches in advanced model; protection rating of IP65-rated for dust, water and weather resistance; interchangeable

probes with PosiTector series for versatility in testing; and confirms to ISO 2178/2360/2808, ASTM B244/B499/D7091 standards, and many more. The unit has a 2.8 inch impact resistant color touchscreen, and comes included with a NIST/PTB traceable certification of calibration. It has a battery life of 20+ hours of continuous operation with 3 AAA batteries

The PosiTector® 6000's rugged design, combined with high-speed measurement capabilities and advanced connectivity options, makes it an essential tool for quality control (QC) and research & development (R&D) applications.

More details:
khushbooscientific.com

Biuged's UV light accelerated weathering tester

The Biuged BGD 855 and 856 UV light accelerated aging test chamber adopts fluorescent UV lamp as the light source, notes a write-up from the manufacturer. Fluorescent UV light can emulate the effect of sunshine, while condensation and water spray system can emulate the effects of rain and dew. During the test, radiation energy and temperature are controllable. A typical test cycle generally carries out under strong irradiation of UV light or in the dark and well condensation period with 100% relative humidity. These tests are generally applied in the fields of paint and coatings, automotive industry, plastic, wood, etc and

Enhancing coating performance: The essential role of dehumidification

In industries like tank manufacturing, pipelines, and reactors, climate control is crucial during blasting, painting, and coating processes. High humidity can lead to condensation on metal surfaces, causing issues such as blooming and flash rust, compromising the longevity of the finish. Common problems, including poor surface preparation and corrosion due to high humidity, underscore the need for a solution that ensures optimal environmental conditions. Desiccant-based dehumidification systems address these challenges effectively, notes a write-up from Technical Drying Services (Asia) Pvt Ltd.

These systems maintain recommended humidity levels, temperature, and ventilation, aligning with paint manufacturer specifications and enabling year-round operation regardless of ambient conditions. The advantages are significant: reduced project time, predictable

conform to ISO, ASTM, BS, SAE and JIS standards.

The machine can be controlled and adjusted automatically during testing processes. The unit's inner



Desiccant-based dehumidification systems maintain recommended humidity levels, temperature, and ventilation, aligning with paint manufacturer specifications and enabling year-round operation regardless of ambient conditions.

tank downtime, longer coating and paint life, prevention of surface defects, improved paint adhesion, and uninterrupted maintenance cycles.

Given that the cost of dehumidification is a small fraction of the total corrosion prevention treatment, investing in desiccant-based dehumidification systems is both beneficial and essential for achieving optimal coating performance and durability. By ensuring the ideal environmental conditions, these systems enhance the quality and longevity of coatings, making them indispensable in industries requiring precise climate control, the write-up notes.

temperature and humidity can be properly controlled to obtain the periodic condensation on the sample for fully evaluating the damage factor caused by sunlight, moisture and temperature (i.e. materials aging phenomenon that includes fading, luster, intensity reduction, cracking, flaking, chalking and oxidation). The unit is controlled by touch screen with an easy to use and maintain menu operation interface.

More details:
aadarshitech.com

PHOTO: BIUGED



Biuged's UV light accelerated weathering tester



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MagicControl – paving the way to Industry 4.0

The new generation MagicControl 4.0 control system made by Gema Switzerland (gemapowdercoating.com) makes the coating process easier to manage. All functions for the powder coating system, the axes and the entire booth system can be smoothly controlled and vital data can be accessed at any time. The control system provides an automation interface in powder coating and ensures intelligent networking for all application components.

allows all stages of the coating process to be easily managed. This includes monitoring warnings and error messages, saving application programs and allocating passwords. The touch screen has self-explanatory icons making it easy to understand and intuitive to use for everyone, Gema Switzerland reports. The parameter settings can be adapted in each case to different types of coating powder. This results in a consistent surface quality and minimum powder use.



Gema's MagicControl makes the powder coating process easier to manage and optimized for more efficient time management.

According to Gema Switzerland, the control system means production processes can be optimized for more efficient line management. The comprehensive functions offered by MagicControl 4.0 can be used in all situations requiring a high-quality coating that can be reproduced at any time and whenever superior coating quality is needed for particularly complex components.

Using the control system

Selected operating data can be saved in an external database called 'GemaConnect.' This ensures that vital application data is readily available for each coating process.

According to Gema Switzerland, it is easy and uncomplicated to integrate MagicControl 4.0 into existing systems and production infrastructures. It can be built into a control cabinet or used as a stand-alone console wherever the coating process takes place.

Mirka® AutoChanger: a new level of automation for robotic sanding

Mirka (mirka.com) is based in Finland and specializes in surface treatment. The Mirka AutoChanger is a smart robotized solution for reliably changing abrasives in an automated process, making it much easier to operate robotic sanding systems.

AutoChanger magazine, which is loaded with abrasive cartridges. After performing the sanding operation for the specified number of times, the sanding head discards the abrasive using a special tool and replaces it with a new abrasive. Sanding can



The Mirka AutoChanger is a smart robotized solution for reliably changing abrasives in an automated process, making it much easier to operate robotic sanding systems.

When producing parts in an industrial setting, a flawless and reproducible sanding result is an essential element of the process. This means that the replacement of abrasives also needs to be carried out smoothly without any room for error.

Mirka has developed a special AutoChanger system for changing abrasive discs in an automated sanding process. The system can be used with the Mirka AIROS 650CV and AIROS 350CV sanding heads.

The safe, modular and intuitive Mirka AutoChanger is available for 77 mm and 150 mm sanding heads. When using the Mirka AutoChanger, the robotic sanding head is programmed to pick up a new abrasive from the

therefore be continued with fully functional abrasives without any need to interrupt the process.

The Mirka AutoChange system is a modular solution. This flexibility enables seamless integration with both new and existing automated sanding systems. Furthermore, it can be customized to fit the unique needs of each sanding application. Suitable for dry sanding, the system also works with mesh materials, foam-based materials and multi-perforation sanding discs. According to the company, customers using this system can benefit from an uninterrupted industrial abrasive process with perfect sanding results.



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Targeted solutions to reduce downtime in critical industrial operations

Corrosion plays a critical role in causing unplanned downtimes in industrial operations. In a chat with CA&CER, Dr Bijal Sanghvi, Director, Axis Solutions Pvt Ltd, discusses how unplanned downtimes can be prevented

Dr Bijal Sanghvi, Director, founded Axis Solutions Pvt Ltd in 1999. With over 25 years of professional experience, Dr Sanghvi's enterprise is recognized by large refineries and petrochemical plants for plant analyser systems and solutions like CEMS, SWAS, GAS, purge panels, HVAC, analyser shelter, TOC, COD, and EQMS analysers, etc.

Axis Solutions Pvt Ltd, is a leading diversified solutions provider in industrial IoT, automation, and analytical technology catering to the unique needs of the oil and energy sectors. With a strong focus on safety and innovation, the company delivers state-of-the-art measurement, control, and automation technologies specifically designed for hazardous industrial environments like refineries and offshore rigs. Their in-house R&D department is continuously developing advanced solutions to meet the operational and

safety demands of the energy sector. Axis Solutions' expertise in developing advanced IoT systems for hazardous industrial locations is a unique value proposition in the tech space. They are also pioneering the integration of Artificial Intelligence (AI) and Cloud Computing into their products to meet future market demands. They serve a diverse range of sectors including oil & gas, petrochemicals, refineries, power plants, coal and mining, and chemicals across India, SAARC countries, Europe, the Middle East, Africa, and the wider EMEA region.

What are the reasons for downtime in critical industrial operations?

Downtime in critical industrial operations is often caused by a range of factors. Equipment failure due to mechanical breakdowns or malfunctions can halt production processes, while maintenance issues, both scheduled and

unscheduled, may result in temporary shutdowns. Supply chain disruptions, such as delays or shortages in raw materials, can also interrupt operations. Additionally, power outages can disrupt machinery reliant on electricity. Human error by operators or staff can cause significant downtime, and process inefficiencies may slow workflows, further delaying production.

Quality control problems often necessitate halting operations to address product defects, while regulatory compliance checks or inspections may lead to temporary shutdowns. Cybersecurity breaches affecting industrial control systems can also cause operational delays. Lastly, inadequate staff training can lead to inefficiencies and errors, contributing to downtime. Addressing these factors is critical for minimizing disruptions and ensuring smooth industrial operations.

What role does corrosion play in causing unplanned downtimes and how can it be prevented?

Corrosion plays a critical role in causing unplanned downtimes in industrial operations by weakening equipment and infrastructure. It can lead to equipment failure through leaks, cracks, or even catastrophic break-



Dr Bijal Sanghvi, Director, Axis Solutions Pvt Ltd.

downs, halting production and posing safety hazards. Corrosion often increases the frequency of maintenance, leading to more interruptions and inflated operational costs. Additionally, it can compromise product quality, requiring production halts to address contamination or defects. To prevent corrosion-related downtimes, protective coatings like paint or epoxy can be applied to create a barrier against moisture and corrosive agents. Using corrosion-resistant materials such as stainless steel or alloys is also effective in corrosive environments. Regular inspections can detect corrosion early, while environmental controls like managing humidity can reduce corrosive conditions. Proper design that minimizes water retention and areas prone to corrosion, along with staff training on corrosion prevention, further helps



Unplanned downtime can have severe consequences for industrial operations, leading to lost revenue, increased costs, and operational inefficiencies.



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maintain the integrity of operations. Implementing these strategies can significantly reduce downtime, improve equipment longevity, and enhance operational reliability.

Your tips to reduce downtime...

To reduce downtime in industrial operations, organizations can adopt several effective strategies. Implementing predictive maintenance through sensors and real-time analytics helps monitor equipment health, allowing potential failures to be addressed before they occur. Regular inspections focused on critical components catch wear and tear early, while a comprehensive maintenance plan balances routine tasks with necessary repairs to minimize disruptions. Training programs for operators and maintenance staff improve skills and reduce human errors, while maintaining an inventory of essential spare parts ensures quick repairs. Standardized procedures (SOPs) streamline operations, and investing in high-quality equipment reduces the likelihood of breakdowns. Fostering a safety culture encourages reporting of hazards, preventing accidents that lead to downtime. Optimizing workflows and conducting root cause analysis after downtime events help refine processes and prevent recurrences. Additionally, engaging employees in problem-solving brings valuable insights that can further improve operational efficiency. By adopting these strategies, businesses can significantly reduce downtime and improve productivity

What are the consequences of unplanned downtime and how does one calculate the cost?

Unplanned downtime can have severe consequences for industrial operations, leading to lost revenue, increased costs, and operational inefficiencies. When production halts, businesses face significant revenue loss, particularly in high-demand environments. Operational costs rise due to emergency repairs, overtime wages, and expedited shipping for replacement parts. Downtime also disrupts workflows, decreasing productivity and efficiency. Additionally, missed production deadlines can damage customer relationships and lead to dissatisfaction. Prolonged downtime may even cause further equipment damage, compounding repair costs and extending recovery time. To calculate the cost of unplanned downtime, businesses must account for lost production revenue by determining the average revenue per hour and multiplying it by the downtime duration. Labor costs during downtime, including overtime pay, should be factored in, along with repair and replacement expenses for parts and equipment. By understanding these impacts, organizations can better mitigate downtime risks and manage associated costs

How does your company help (services provided) in reducing downtime in critical industrial operations?

Our company focuses on reducing downtime in critical industrial operations by offering a range of targeted solutions. We implement



Axis Solutions Pvt Ltd serves a diverse range of sectors including oil & gas, petrochemicals, refineries, power plants, coal and mining, and chemicals.

predictive maintenance systems using IoT sensors and analytics to detect potential equipment failures before they happen. Tailored maintenance programs are developed to balance routine inspections and repairs, minimizing operational interruptions. In emergencies, our rapid response teams provide quick repair services to address unexpected equipment failures. We also offer training programs to improve staff skills in equipment operation and maintenance, reducing human errors. Additionally, we assist in upgrading and retrofitting machinery with more reliable and efficient technology. Our software solutions integrate real-time monitoring and reporting for better process management, while root cause analysis helps identify and resolve issues after downtime events to prevent recurrence. These services enhance operational efficiency, ensuring minimal downtime in critical industrial environments

What is the cost saving to a company using your solutions?

By implementing our solutions to reduce downtime in critical industrial operations, companies can achieve substantial cost savings. Minimizing unplanned downtime through predictive maintenance and real-time monitoring directly reduces revenue losses from production halts. Scheduled maintenance and predictive analytics lower emergency repair costs and extend equipment lifespan, cutting overall maintenance expenses. Streamlined operations and improved workflows boost productivity, allowing businesses to produce more in the same timeframe, which increases revenue. Optimized labor processes, supported by staff training, reduce the need for overtime or additional labor during emergencies, lowering labor costs. Additionally, improved inventory management and supply chain control minimize holding costs and reduce the need for costly expedited shipping of emergency parts. These factors combined result in significant savings and improved operational efficiency.



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Komal Scientific International Pvt Ltd: A one-stop source for testing instruments

Advances in technology and a heightened focus on quality assurance are driving demand

Komal Scientific International Pvt Ltd, continues to raise the bar in the instrumentation sector, with a focus on innovation, sustainability, and cutting-edge technology. The Mumbai-based company has been awarded the prestigious CRISIL SME 1 Grading for the sixth consecutive year, highlighting its position as a leader in the industry. "This recognition is a testament to our unwavering commitment to excellence, financial strength, and the trust placed in us by our partners and clients," said Mr Prasan

Bachhawat, Chairman and Managing Director.

Reflecting on this achievement, Mr Bachhawat emphasized, "Our success is built on the hard work of our dedicated team and the continued support of our loyal clients. Together, we have created a legacy of quality and reliability."

Adding to this milestone, Komal Calibration Lab, a division of the Group, has recently achieved the prestigious NABL (National Accreditation Board for

Testing and Calibration Laboratories) certification. "NABL accreditation is not just a recognition; it's a promise of precision and reliability," Mr.

Bachhawat added. "This certification reinforces our leadership in the industry and our relentless pursuit of excellence."

Komal Scientific International Pvt Ltd offers a comprehensive range of advanced



Mr Prasan Bachhawat, Chairman and Managing Director and Mr Mayank Bachhawat, Director.

testing instruments from top global brands like TQC Sheen, Ametek Brookfield, C&W Scientific Equipment, Sartorius, Coatmaster, Elcometer, DeFelsko and more. These instruments are available ex-stock in Indian

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Komal Scientific International Pvt Ltd offers a comprehensive range of advanced testing instruments from top global brand.



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rupees and can be experienced through live demonstrations at the company's spacious Mumbai showroom.

Positioned as a one-stop solution for scientific and laboratory testing instruments, Komal Scientific International Pvt Ltd specializes in sectors like paints, ink, powder coating, automotive, surface coating, adhesion and pigmentation. Despite being imported, these products come with a one-year warranty against manufacturing defects. "Our pricing is competitive, and we back it up with prompt after-sales service, ensuring a hassle-free experience for our clients," noted Mr Bachhawat.

With India's infrastructure sector booming, Mr Bachhawat predicts a bright future for the instrumentation industry. "Advances in technology and a heightened focus on quality assurance are driving demand. As a provider of state-of-the-art paint testing equipment, we are excited about the future of this sector."

He also emphasized the increasing importance of data-driven decision-making, innovation, and sophisticated

instrumentation. "Manufacturers are now able to achieve unprecedented levels of accuracy in their QA/QC processes. This not only ensures compliance with industry standards but also contributes to the development of superior quality paints."

Sustainability is another key factor shaping the industry. "As environmental concerns grow, both consumers and manufacturers are turning towards eco-friendly solutions," said Mr Bachhawat. "Our instruments play a vital role in testing and developing sustainable paints, aligning with global environmental priorities."

The entry of international players into the Indian market has further raised the stakes, with stricter regulations and higher quality standards being enforced. "Instrumentation will need to evolve to meet these global requirements, and we are at the forefront of that evolution," Mr Bachhawat observed.

Looking ahead, the future of paint testing is undeniably tied to Industry 4.0 technologies. "Smart technologies such as IoT connectivity,



automation, and real-time monitoring are transforming the QA/QC ecosystem, making it more efficient and connected than ever," said Mr Bachhawat.

Since its founding in 1993, Komal Scientific International Pvt Ltd has continuously evolved, and the next

generation is now actively contributing to the company's growth. Mr Mayank Bachhawat, with his fresh ideas and innovative approach, is ensuring the company remains a seamless blend of tradition and modernity, driving it forward into the future.



COATINGS AND ANTI CORROSION ENGINEERING REVIEW

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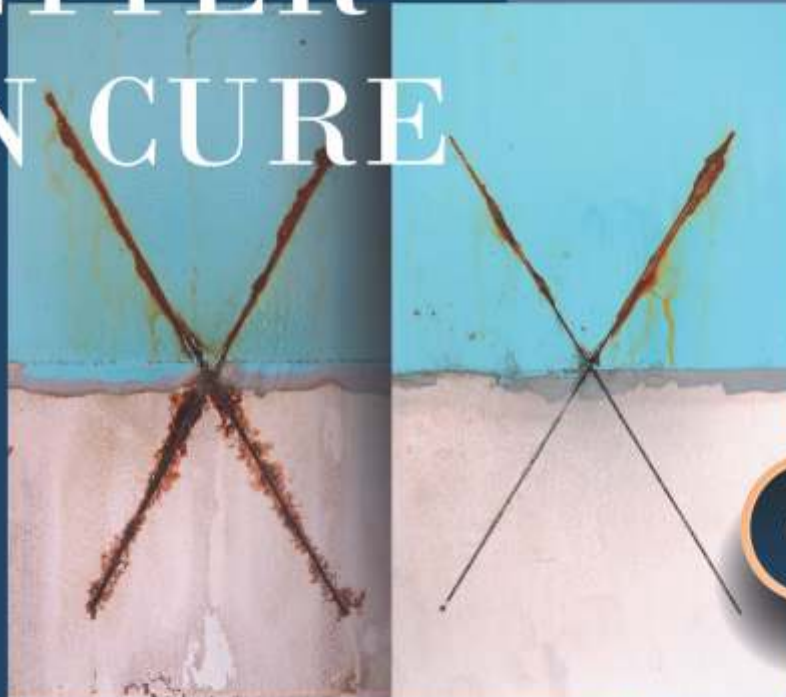


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Polymeric leading edge protection extends lifespan of 42 wind turbine blades

Given the important role wind power plays in the transition to net zero, it is absolutely critical that windfarms are maintained to an excellent standard

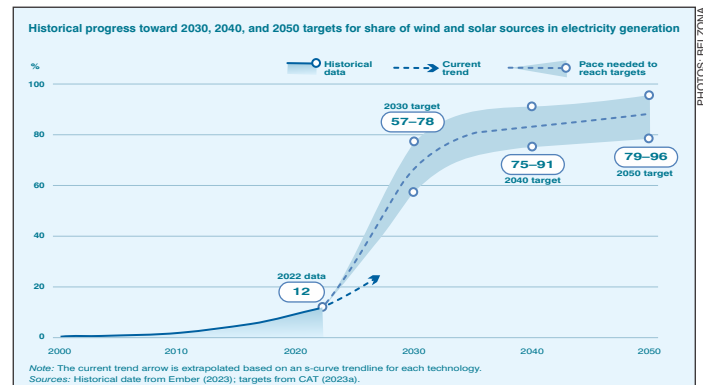
In order to achieve net-zero by 2050, according to a 2023 Report from the world-leading authority on climate science, Climate Action Tracker: 'wind and solar sources in electricity generation will need to reach 57 – 78% by 2030, and 79 – 96% by 2050.' In 2022, this figure sat at 12%. Needless to say, a colossal scale-up of these industries is anticipated over the upcoming decades.

Polymeric technology supports transition to 79 – 96% renewable energy by 2050

Given the important role wind power plays in the transition

to net zero, it is absolutely critical that windfarms are maintained to an excellent standard. Otherwise, damaged wind power assets may needlessly be decommissioned and replaced; the process of which comes with a hefty carbon footprint as well as considerable financial expenditure.

As such, asset owners are investing in a simple yet extremely beneficial (both from a cost and environmental perspective) solution to extend the lifespan of wind turbines. This solution involves the use of polymeric repair composites and high-



Historical progress toward 2030, 2040 and 2050 targets for share of wind and solar sources in electricity generation (Source: State of Climate Action 2023).

performance protective coatings to repair and protect key assets in the wind industry. This includes: turbine blades, nacelles and generating components,

turbine bases, towers, transformers, amongst other assets.

The use of this technology is based on a circular economic business model: repairing damaged assets rather than replacing them. In turn, not only does this mitigate the carbon footprint incurred during the replacement process, but it is also enables the asset owner to make significant financial savings as well.

Case study: 42 wind turbine blades repaired and protected

At an onshore Windfarm in Denmark, 42 wind turbine blades were exhibiting signs of severe erosion on the leading edges. Previously, the Customer had used pre-formed shells that were bonded onto the substrate to provide leading edge protection. However, this process proved to be



Leading edge protection of wind turbine blade using polymeric technology.



Thixotropes for anti-corrosive paints: Revolutionizing coating performance

Introduction

In industries ranging from oil and gas to marine and construction, heavy-duty anti-corrosive coatings are essential for protecting assets against the relentless effects of corrosion. These specialized coatings not only extend the lifespan of structures and equipment but also reduce maintenance costs and enhance safety. From oil rigs to bridges, these coatings face some of the toughest environments, necessitating advanced technology and innovation to combat corrosion effectively. This article delves into the significance of thixotropes, their mechanisms, and their applications in anti-corrosive paints, highlighting their role in improving performance and durability.

Innovative technologies in heavy-duty coatings

The development of heavy-duty anti-corrosive coatings has seen significant advancements, including:

- 1. Zinc-rich coatings:** Containing high levels of zinc, these coatings offer galvanic protection. When applied as a primer, they protect the underlying metal by sacrificing the zinc in corrosive environments.
- 2. Polyurethane coatings:** Known for their flexibility and UV resistance, polyurethane coatings provide excellent protection as topcoats. They enhance aesthetic appeal while offering long-lasting durability.
- 3. Epoxy coatings:** Recognized for their strong adhesion and chemical resistance, epoxy formulations are ideal for harsh environments. They are often used as primers to provide a solid foundation for additional layers.

In heavy-duty coatings, especially anti-corrosive paints, achieving a uniform application that resists settling and sagging is crucial for both performance and aesthetics.

Understanding settling and sagging

Settling occurs when solid particles, such as pigments and fillers, migrate to the bottom of a container during storage, leading to uneven distribution when the paint is applied. This affects paint stability, resulting in inconsistent color, texture, and performance.

Sagging happens when a coating flows downwards under its own weight after application, leading to an uneven surface and inconsistent coating thickness. Both settling and sagging can severely impact the effectiveness and appearance of heavy-duty coatings, making it essential to incorporate additives that mitigate these issues.

Disparlon and Namlon thixotropes

Disparlon and Namlon offer a range of additives that enhance the rheological properties of paint formulations. They possess the unique ability to thicken the paint under low shear conditions while allowing for easier application under high shear conditions. This behavior is critical in preventing settling and sagging.

How Disparlon and Namlon thixotropes combat settling

- 1. Improved suspension stability:** Powder thixotropes help maintain a stable suspension of solid particles within the paint. By increasing viscosity at rest, these additives prevent heavier pigments and fillers from settling to the bottom, ensuring a consistent mixture during application.
- 2. Enhanced mixing uniformity:** The incorporation of thixotropic agents facilitates better dispersion of pigments and other solids in the paint. This uniformity not only improves color consistency but also enhances the overall performance of the coating.
- 3. Controlled flow characteristics:** Thixotropes enable manufacturers to fine-tune the flow properties of paints, helping maintain stable viscosity during mixing and application, which reduces the likelihood of settling.

Disparlon liquid rheology modifier – **NEW**

In response to market needs and customer expectations, Kusumoto has developed a 100% active polyether phosphate-based rheology modifier for high filler/pigment-loaded heavy-duty coatings. Unlike powders, these liquid modifiers are easy to incorporate and disperse under high shear, imparting excellent thixotropic properties, making them ideal candidates for high-build epoxy and polyaspartic coatings.

Disparlon pre-activated pastes

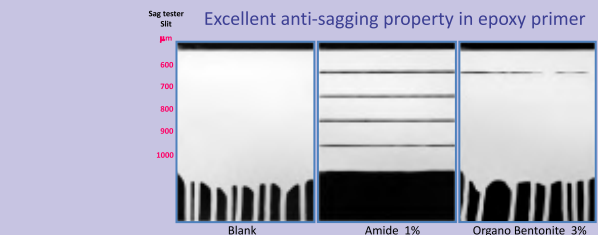
Complementing powder thixotropes, Kusumoto also manufactures pre-activated paste additives based on amide and polyethylene. These additives are designed for ease of use and dispersion, providing long-term anti-settling and sagging benefits without adversely affecting paint viscosity. A wide range of waxes is available, varying in solids and solvent combinations for diverse applications.

Disparlon/Namlon Powder thixotropes

Disparlon and Namlon include castor, castor blend with amide, and 100% amide-based rheology modifiers for heavy-duty coatings. Being 100% active, these waxes are not only cost-effective but also provide properties such as anti-sagging and maintained anti-settling. Unlike organoclays and bentonites, these thixotropes are hydrophobic in nature, enhancing salt-spray resistance and improving the life of coatings. Notable grades include Namlon T205, T206, Disparlon 6650, 6500, and RE 9000, which are widely approved for these applications.

Conclusion

Kusumoto is a pioneer in thixotropic additives with over 90 years of experience and patented technology based on castor and amide derivatives. Their products meet the expectations for high-build heavy-duty anti-corrosive coatings. Unique proudly represents Kusumoto as a distributor in India, providing their products and technical assistance. Unique also partners with various principal companies in India, including those offering resins, anti-corrosive pigments, UV stabilizers, and micronized PTFE/PE waxes, to complement the paints and coatings applications. For inquiries, please contact us at sales@uniquesc.in.



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Damaged wind turbine leading edge.

extremely time-consuming and expensive. Therefore, the Customer was seeking an alternative solution which would be financially viable and also ensure optimal operation for many years to come.

Specification of polymeric leading edge protection system

Based on test results, the ease of application as well as the high-quality finish that can be achieved, the Customer decided to repair and protect the leading edges with a combination of Belzona 5711

and Belzona 5721.

The thixotropic paste, Belzona 5711, which is now supplied in a larger unit and more robust side-by-side cartridge, is specially designed to be applied in conjunction with the Belzona 5721 protective coating. This solvent-free LEP system is formulated for the in-situ repair and rebuilding of leading edge erosion and impact damage on wind turbine blades.

Simple application method

Commenting on the application process, Morten



Leading edge repaired and protected with Belzona 5711 and Belzona 5721.

Sivertsen, General Manager at AESSEAL Danmark A/S said: “Surface preparation was carried out on each of the 42 blades, followed by the direct application of 90 kg (198.4 lbs) of Belzona 5711 from self-mixing cartridges onto the blade. The repair area was then contoured using a piece of Belzona mixing board. Once cured, a visual inspection was conducted to ensure the application's readiness for overcoating with 144 kg (317.5 lbs) of Belzona 5721. Using a short-bristled brush, this system was then applied to the leading edge and left to cure for 30 – 60 minutes. With three rope access technicians carrying out the applications, on average, six – nine turbine

blades were completed each day.” this enabled the Customer to make considerable financial savings as it mitigated the profit loss that can be incurred through lengthy periods of downtime.

Safeguarding key wind power assets for the long term

The scaling up of the wind power industry is absolutely critical in order to support the transition to renewable energy, in keeping with the net zero by 2050 pathway. By safeguarding key assets within this industry through the use of polymeric technology, asset owners can successfully bypass the environmental and financial costs associated with asset replacement. Therefore, it could be argued that polymeric technology plays an intrinsic role in supporting this energy transition.



Belzona 5711 is now available in a new, more robust cartridge.

blades were completed each day.”

In-situ repair ensured minimum downtime was incurred

As the polymeric systems were applied in situ without the need for specialist tools or equipment, this ensured that a fast and seamless application was carried out. Thus,



Author: **Chloe Hirst** (chirst@belzona.com) is the Senior Copywriter at Belzona Limited and is based in Harrogate, England. Chloe regularly writes case

studies and thought leadership content featuring a variety of different industries, with a special focus on the renewables sector. In both 2023 and 2024, she won the Best Manufacturing Content Creation Specialist (UK) award as part of Acquisition International's Influential Businesswoman Awards.



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Urbanization, infrastructure development to spur growth for waterproof coatings

According to a report by Future Market Insights, Inc, the global waterproof coating market is set to thrive at a CAGR of 4.02% and reach an anticipated value of US\$23.45 billion by the year 2032

After water, concrete is the most widely used material on earth. Approximately 4.3 billion tons of cement – the principal ingredient in concrete – were produced in 2021. Concrete is a composite material made from water, aggregate, and cement. It is strong, durable, and resistant to water. The major use of concrete is its use in construction of buildings, bridges, dams, roads, and other infrastructure. It is also used for foundations, pavements, columns, beams, and supports.

But concrete can corrode. Concrete corrosion happens when concrete breaks down due to exposure to corrosive substances. This can happen when concrete which is alkaline in nature is exposed to sulfur compounds, salty or acidic water, chlorides, microbes, nitrates, fluorides...

Concrete corrosion can be dangerous because concrete is porous, allowing corrosive materials to soak in and cause damage from within. It can also weaken the structure of reinforced concrete, as the steel bars that provide strength can corrode as well.

To prevent concrete corrosion, one can use high quality aggregate and cement; use epoxy grout; use polymeric fibers; use non-corrosive metals like stainless steel; ensure proper curing and sealing; or use corrosion inhibitors. One can also use concrete monitoring sensors to detect and prevent corrosion. But one of the most common practices is the use of concrete coatings.

Rebar rusting

The reinforcing steel inside the concrete basically rusts and it expands up to seven



PHOTOS: 123RF

times its volume. The concrete that surrounds it breaks and that causes significant deterioration in the structural integrity of that particular beam or column. All it takes is one beam or column to fall to cause a domino effect.

Rusting rebar expands within concrete primarily due to the formation of iron oxides (rust) as the steel rebar reacts with moisture and oxygen.

This expansion can lead to:

- **Cracking:** Concrete can crack due to the pressure exerted by expanding rust.
- **Spalling:** Pieces of concrete may break off as the pressure increases.
- **Structural Integrity:** Over time, the structural integrity of the concrete can be compromised.

Applying a waterproof coating provides an additional protective layer against

external damaging elements, but also be used to enhance aesthetics. These coatings can range from anti-corrosion paints to sealants that prevent water and corrosive agents from penetrating the concrete.

Waterproofing is done on a structure to prevent water from entering the structure and causing damage. It creates an impervious barrier protecting the structure from water seepage and leakages during weather conditions like rain. By making the surfaces of the building like roofs, walls, foundation, surfaces and other parts integral in maintaining the structural integrity of the building waterproof, the process prevents buildings from water damage and ensures that the structure is protected from any chemical damage and corrosion.

Selecting the appropriate waterproofing chemicals



depends on the area of application. Different surfaces and environments require specific types of waterproofing solutions. For example, flat roofs, basements, and bathrooms have distinct requirements due to their varying exposure to water and moisture. Choosing the right waterproofing chemical depends on the above situations and areas. This is something that should be considered right at the construction stage itself and the product description should reflect the actual performance in the environment or condition where the product is going to be used.

There are different kinds of waterproof coatings:

Liquid-applied waterproofing: Liquid-applied waterproofing is a popular solution used to create a seamless barrier against water infiltration. This type of waterproofing involves applying a liquid membrane directly to the surface, forming a protective coating that prevents water penetration in concrete. It is commonly used on flat roofs, balconies, concrete areas of bathrooms, and other water containment structures.

The ability of liquid-applied waterproofing to adapt to uneven surfaces and produce a continuous, seamless layer is a key benefit. It offers excellent adhesion to various substrates, ensuring a reliable waterproofing solution. Liquid-applied waterproofing is also flexible, which allows it to accommodate structural movement without compromising its effectiveness.

Sheet applied: Sheet-applied waterproofing involves the use of pre-fabricated membranes that are mechanically attached, hot-welded or adhered to the surface using adhesive. These membranes are typically made of bitumen, modified bitumen, or synthetic materials like PVC or EPDM, TPO, ECB, HDPE.

Sheet-applied waterproofing offers excellent durability and resistance to punctures and tears. The overlapping seams create a watertight barrier that prevents water from seeping through. This type of waterproofing is commonly used for below-grade applications such as basements and retaining walls, as well as for large roofs, decks, and plaza areas.

Integral waterproofing:

Integral waterproofing is a method of incorporating waterproofing additives directly into the concrete mix during the construction process. These additives work by filling the capillary pores within the concrete, reducing its permeability and enhancing its water resistance.

One of the significant advantages of integral waterproofing is that it becomes an integral part of the concrete itself and performs well without any extra labor or cost. Integral waterproofing is commonly used in various applications, including basements, swimming pools, and water tanks along with the concrete tanks as well.

Another important factor is the use of right equipment for waterproofing. This depends on the type of waterproofing and the surface being worked on.

It is also essential to follow the manufacturer's instructions for proper application with properly trained and skilled applicators.

Here are some other things to consider when waterproofing:

Surface preparation: Clean the surface, remove debris, and repair cracks.

Material selection: Choose high-quality materials that are suitable for your surface type, environment, climate, and level of water exposure.

Maintenance: Perform regular

inspections to address any signs of wear and tear, damage, and deterioration.

Market scenario

According to a report by Future Market Insights, Inc, the global waterproof coating market is set to thrive at a CAGR of 4.02% between 2022 and 2032 while holding a value of US\$15.81 billion in 2022. The anticipated value is US\$23.45 billion by the year 2032.

Waterproof coatings are expected to grow significantly in the coming years due to their increasing demand across various industries. As a result of the increasing population and rapid urbanization, waterproof coatings have become more popular around the world, which will aid in the growth of the market. In addition, the increased commercial and residential infrastructure around the world is expected to result in a rise in demand for waterproof coatings and thereby drive growth in the market. Research and development initiatives based on end-user industries have led to significant reductions in the costs of waterproofing materials. A growing awareness of structural damage from water infiltration is expected to spur demand for these products substantially in the future.

Growth factors

Urbanization: Today, 4.2 billion people - more than 55% of the global population - live in cities. By 2050, this proportion will rise to 68%. In the years to come, more than 7 of 10 people on this planet will live in cities as urban populations double. Urbanization, which



generates more than 80% of global GDP, can contribute to sustainable growth if managed well by increasing productivity, allowing for innovation and new ideas to emerge. The United Nations estimates that by 2050, urbanization, the gradual shift of human settlement from rural to urban areas, combined with the overall growth of world population, will add another 2.5 billion people to urban areas. Nearly 90% of this growth will occur in Asia and Africa. Because of the dangers of water and wet surfaces, there is an increase in the demand for high-quality waterproofing products. With the improved standard of living and gradual rise in per capita income, the demand for waterproof coating is expected to rise (source: World Bank & UN).

Rapid infrastructural development: Typically, water-resistant coatings are applied to the surface of residential and commercial buildings. The demand for waterproof coatings is expected to grow worldwide, due to the growth in residential and commercial infrastructure. The construction industry is evolving, and for building contractors to remain competitive, they need to provide their customers with longer-lasting, high-performance solutions. A good waterproofing system is crucial for maintaining the health and comfort of residents as well as preventing structural damage. In building construction, water damage can jeopardize projects, infiltrate cracks and cause structural problems. Therefore, homeowners and contractors alike strive to

prevent exposure to rainwater and other elements.

There are a number of players in the Waterproof Coating Market. Key companies continue to drive innovation and adopt digital transformations in most cases, however, the overall competitive ecosystem is dominated by market leaders as well as emerging players with niche offerings. Some of the major players of the market include Minerals Technology Inc., Soprema Group, Sika AG, and BASF SE.

A greater share of the waterproof coating market will be held by Asia-Pacific in the coming years, especially in China, as well as fast-growing regions like India.

Future growth prospects of the market will be enhanced by the development of unique product formulation technologies and products. Additionally, the market is driven by the increasing need for eco-friendly coatings.

BASF introduces MasterSeal® 730 UVS waterproofing membrane for integral sealing of below grade structures

BASF introduces an innovative waterproofing membrane, MasterSeal® 730 UVS in Asia, to expand its versatile waterproofing portfolio under its Master Builders Solutions brand. MasterSeal 730 UVS is a pre-applied, high-density polyethylene (HDPE) sheet waterproofing membrane treated with unique pressure-sensitive adhesive and protective coating to enable good adhesion with concrete



surfaces without requiring additional protective screed.

Being cold- and pre-applied, MasterSeal 730 UVS is easy to install without the need for heat or open flames and other special equipment. After the installation of steel reinforcement, it provides a durable and monolithic bond by forming an integral seal during the concrete pour. It remains fully adhered to the concrete and retains its performance even if there is ground settlement.

“Good waterproofing is the key factor in ensuring a structure's longevity and durability. Careful consideration at the structural design stage can limit cracks, leaks and potentially serious structural damage over a building's life cycle. MasterSeal 730 UVS waterproofing sheet membrane can be integrated into the structural design for below-ground structures to ensure durable water tightness and resist unwanted lateral water ingress,” said Nilotpol Kar, Head of Regional Business Segment, BASF Construction Chemicals Asia Pacific. “Thanks to the waterproofing technology, the installation process is almost like an art-and-craft where you simply

place and stick the membranes onto the concrete substrate. With the support of our expert team, structural detailing during the construction stage can be significantly improved by minimizing installation errors and site wastage.”

The unique bonding system utilizes an inorganic modified protective coating that provides dual adhesion to the concrete even after exposure to site contamination, heat and sun. MasterSeal 730 UVS and auxiliary materials (including adhesive tapes to ensure full bonding and easy to execute detailing) are environmentally and user-friendly waterproofing solution that greatly improves the overall installation process and enhances the safety of the applicators without the need of specific tools and equipment.

MasterSeal 730 UVS is used for below grade concrete in the construction of basement slabs in mixed-use development including commercial, residential, underground car parks, and industrial buildings, as well as cut and cover tunnels. MasterSeal 730 UVS is now commercially available across Asia Pacific.

Sika upgrades SikaProof® range with next-gen product

Sika has designed the next generation of waterproofing membrane with the launch of SikaProof® A+, a new system for below-ground waterproofing of reinforced concrete structures.

Building on the legacy of its predecessor, SikaProof® A, SikaProof® A+ has been designed with the very latest technology to provide a modern solution.

The product comprises the same flexible polyolefin waterproofing membrane and has been proven over many years with SikaProof® A, but now employs a unique cementitious hybrid layer, providing both chemical and mechanical bonding with the concrete structure. Fully bonded membranes eradicate the lateral migration of water between the membrane and structure, helping to stop defects in their tracks.

Joints are sealed with a single cold-applied tape reducing complexity at laps and joints. The tape has excellent adhesion to the membrane and incorporates the same

hybrid cementitious technology on the rear to give continuity of the same fully bonded, chemical and mechanical bond.

SikaProof® A+ forms the primary component of pre-applied Type A waterproofing, designed for below-ground structures. The product is used for damp-proofing, waterproofing and concrete protection for basements and other below-ground concrete structures.

Fosroc's roof waterproofing solutions

Fosroc have recently introduced Polyurea WH 100, a product which gives many benefits to a wide range of roof waterproofing applications.

Its hand-applied application makes it very easy to install which is especially beneficial in flat roof applications where detailing can be tricky and spray equipment might not be available.

Its seamless finish, coupled with all the performance from polyurea technology, gives



assurance of long lasting waterproofing. Return to service times are quick allowing subsequent trades to quickly follow on with minimal delay, meaning reduced construction times are possible.

This new additional grade further strengthens Fosroc's Polyurea portfolio catering for all market sector waterproofing requirements.

Bostik unveils smart waterproofing solutions Seal & Block in India

Bostik India proudly highlighted the value of their newly launched innovative waterproofing technology with the SEAL & BLOCK range in achieving more sustainable infrastructures, which is key to economic growth.

Covering various waterproofing jobs around the home and buildings, Seal & Block waterproofing technologies are specially formulated to prevent the migration or rise of moisture to extend the duration and improve the durability of the construction build.

The Seal & Block waterproofing range cover interior and

exterior waterproofing applications, from basement to roof. Simple to apply and safe to use, Bostik's waterproof solutions with the full range of porous backgrounds include concrete, brick, stone, metal and cement board.

Stop a leak, repair an existing roof, or fit a new roof with our entire range of preformed sheet membranes to protect one's build from water penetration. These membranes cure to form an elastic waterproof seal that can be applied using a roller or brush. These durable membranes feature strong adhesive properties and will bond with most surfaces. From HDPE to TPO the entire basement protecting systems will add a layer of reliable and durable protection against water damage.

Bostik's range of cementitious solutions are ideal for working with wet areas, balconies, swimming pools and other interior assemblies composed of tiling or tile-based substrates. They also produce acrylic cementitious products that are formulated specifically to combat positive water pressure.



Protection of underground pipelines by coatings

In order to assure the safety of the people and environment, utmost care has to be taken, while designing, commissioning and operation of oil and gas pipelines

Introduction

In today's world, production of various petroleum products, such as petrol, diesel, compressed gas (CNG), and several other hydrocarbons, decide the economy of a country. Pipelines are the integral part of oil and gas industry. After exploration of crude/gas from sea, it is transported to distribution terminal through under sea pipelines and from this terminal, then the crude is transported to storage tanks, refineries and petrochemical plants, and the gas is transported directly to utilities such as power plants, fertilizer plants, homes, hotels and industries. Pipelines, therefore, are the essential component of the oil and gas production. In order to assure the safety of the people and environment, utmost care is taken, while designing, commissioning and operation of these pipelines.

Safety issues of the pipelines are directly related to the internal or external surface of pipelines. While the internal safety is directly related to the

crude and gas quality and on the condition or preparation of internal surface to avoid issues such as drag which affects the flow of the fluid; external surface poses even greater safety issues, mainly related to the corrosion of the pipe from various kinds of terrain. Thus, transportation of crude/gas through pipelines today is a very big issue and has also become multi-disciplinary and with huge expenditure. In order to make the pipelines safe, metallurgy of steel, design of pipelines, internal flow characteristics of the fluid, health monitoring, maintenance, corrosion management and pipeline integrity, are involved.

Prerequisites to pipeline selection

The following are some of the initial requirements that need to be fulfilled before the transportation of crude is actually made operational:

Type of product to be transported: this often sets the parameters for engineering and routing of the proposed pipeline.

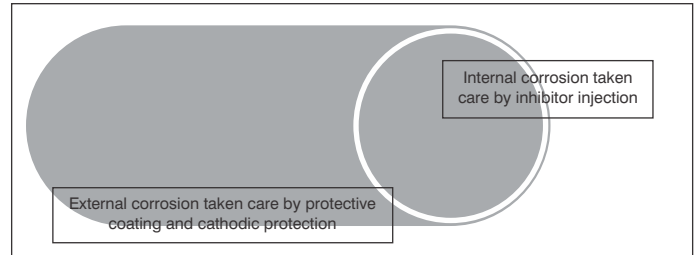


Fig 1: Schematic of an underground pipeline.

Survey of the route through which the pipeline has to pass: for example, details on the route and their locations, dimensions, and so forth; sea; roads (crossing and alongside the route); rivers; drains; pipelines; bridges; rail tracks.

The materials used for pipelines: Steel is the only material that can be used to construct pipelines. Over the years, several modified steels have been designed to enhance strength as well as specific corrosion problems such as stress corrosion cracking, sulfide corrosion, and so forth.

A list of various steel formulations is given in Table 1.

Corrosion problem in pipeline

Corrosion cannot be com-

pletely avoided but can be reduced considerably and the effective lifetime of the piping system prolonged if its cause and development are known and the piping system is installed and operated with this knowledge. The schematic of pipeline corrosion can be represented by the diagram shown in Figure 1.

As can be seen, pipelines suffer from both internal and external corrosion. Internal corrosion is due to presence of sulfur-bearing gases such as hydrogen sulfide, carbon dioxide, and moisture, which is entrapped as brine from the sea. The usual rule of thumb is that the internal coatings are applied only if the crude/gas is sour in nature (its hydrogen sulfide concentration is more than 500 ppm). Otherwise, the internal corrosion is usually tackled by addition of inhibitors, either continuously or in a batch process.

The main problem is the protection of external surface, mainly due to the corrosive nature of the soil. Across the pipeline route, the soil can be soft mud, hard mud, rocks, sand, sand with minerals, moisture, and other environments such as marshy lands,

Chemical Composition of Various Steels Used for Underground CCPs

Element Grade	C	Mn	P	S	Cr	Cu	Ni	Mo	Al	Si	Nb/Ti	Yield Strength (MPa)	Ultimate Tensile Strength (MPa)
X42	0.09	0.84	0.013	0.004	0.07	-	0.02	0.02	0.03	0.22	-	290	414
X46	0.09	1.28	0.014	0.009	0.02	-	0.03	0.03	0.02	0.25	-	317	434
X52	0.09	1.31	0.012	0.006	0.01	-	0.07	0.003	0.03	0.25	-	359	455
X56	0.12	1.27	0.017	0.004	0.07	-	0.14	0.19	0.02	0.26	-	386	490
X60	0.12	1.48	0.013	0.004	0.01	-	0.09	0.02	0.008	0.27	-	414	517
X70	0.13	1.71	0.012	0.001	0.07	-	0.07	0.02	0.05	0.30	-	483	565
X100	0.064	1.56	0.024	0.0024	-	0.38	0.54	0.28	0.03	0.13	0.089/0.011	690	760

Table 1: Chemical composition of various steels used for underground CCPs.

brackish water, seawater, and so forth. Ordinary steel with several compositions, shown in Table 1, shows severe corrosion, general corrosion, pitting, or stress corrosion. One kind of serious corrosion problem that takes place is microbiological corrosion, which occurs due to presence of sulfate-reducing bacteria (SRB). They convert sulfate in soil to sulfide, which attacks steel, causing severe pits. Thus, external corrosion is taken care of by a combination of a good coating and cathodic protection. Let us now deal with internal and external corrosion in more detail.

Selection of protective coating for underground pipelines

Coatings are a natural choice to create a barrier for the corrosive environment in soils. Over the years, there have been different coating materials and formulations used to protect pipelines. For example, in the 1940s and 1950s, coal tar, wax, and vinyl tape were used; in the 1960s, asphalts were used; and in the 1970s to the present day, fusion-bond epoxy (FBE) was and is being used. Polyethylene (PE) tape and extruded PE jacket material also have been used from the early 1950s to the present day.

It is most important to note that the coating alone is not a permanent solution for the corrosion protection of pipelines as the coating deteriorates with time while interacting with environment. Hence, to take care of this degradation in the underground pipelines, an additional protection using cathodic protection is given. A total pipeline protection system thus includes consideration of steel quality, coating application, surface condition and treatments, design of coating, and cathodic protection system.

Pipeline coatings

Though there are many types of coatings that have been applied on buried pipelines, the three main coatings commonly used for pipelines are coal tar, FBE coating, and three-layer PE (3LPE) coatings. It is important to discuss the salient features of these coatings, while extensive information on the same can be found elsewhere.

Coal tar coatings

Coal tar enamel (CTE) protective coating systems have been used to protect underground and subsea pipelines from corrosion for decades. Its ease of application, low cost, compatibility with cathodic protection, and



PHOTOS: 123RF

proven performance in the field for over 80 years make it a popular choice of pipeline companies worldwide. Its resistance to water absorption, hydrocarbons, soil chemicals, and bacteria is excellent. The CTE coating system has evolved into a sophisticated application of primers, multiple grades of plasticized enamel, and high-strength-resin-bonded glass fiber wraps. These improvements have resulted in a CTE coating system with greater bendability, improved handling characteristics, an increase in the temperature exposure range from -28°C to 80°C , and a lower safe handling temperature of -10°C . The most serious drawback of CTE coatings is the emission of carcinogenic vapors during its applications, which not only threatens the workers carrying out the application but also pollutes the environment. Many Western countries have completely banned the use of this system. In India, CTE is still being used sparingly by some oil companies. The most commonly adopted CTE coating system, in use within the country, is CTE applied often over a primer and at times with two or three layers of fiberglass reinforcements.

FBE coatings

Out of various organic coatings, epoxies have the strongest resistance to

oxygen, moisture, and chlorides, which are important constituents of soil. Further, they are highly insulating with very low conductivity and high dielectric resistance. That is why epoxies are the preferred choice where strong corrosion resistance is the main requirement. There are many ways by which the epoxy coatings can be applied: brush, spray, using liquid epoxies, or electrostatically spraying the fine epoxy powder on a heated pipe, which immediately melts it and fuses instantly.

The coating has good cathodic disbondment resistance, hot water resistance, and good flexibility (5° of pipe diameter) at -50°C . FBE coatings are thermosetting compounds, which, once set, cannot be remelted. The most important requirements of the coating are surface cleanliness, proper heating, and sufficient cure. The first step is the blast cleaning of the pipe to Sa $2\frac{1}{2}$, followed by heating the pipe uniformly using an induction furnace. This is followed by electrostatic spraying of FBE powder, which immediately melts and fuses. The hot coated pipe is quenched immediately. The temperature at the pipe surface usually ranges from 180°C to 210°C . The coating thickness depends upon the pressure of the FBE powder, electrostatic



voltage, and conveyor belt speed. A 350–500 μm coating is required from a pipe diameter of 8 to 36 in.

Multilayer coatings

One of the drawbacks of such a thin-coated pipe is its damage during transportation and handling. In the mid-1980s and in the beginning of the 1990s, two additional coating systems were discovered. The first was the 3LPE system and the other was the dual-layer FBE system. The purpose of both these systems was to enhance the damage resistance of the single-layer FBE coating, described above. In 3LPE, it was achieved by the application of an extruded PE coating of 1500 to 3000 μm over the FBE primer layer of 100–150 μm . Since it is not possible to directly coat a PE layer over an already-coated FBE layer, an intermediate adhesive coat of polyolefin is made, which adheres primer to the FBE layer through its polar functional groups and to PE by its hydrocarbon groups. The temperatures required to coat an adhesive layer and PE layers are, respectively, 220°C and 238°C, and the two coatings must be applied within a small time interval of 13–25 seconds (depending upon the pipe surface temperature).

In dual-layer FBE coating, an outer layer of FBE powder of different composition is applied over the primer layer. The purpose of the inner layer is to have strong adhesion to the pipe, while the outer layer is expected to be very tough to have high impact resistance. 3M made a coating system where the outer layer achieves maximum toughness because of the cellular structure of the coating. The method of application is very

similar to that of a single FBE coating, and coating can be carried out in a single booth, with some guns carrying inner-layer powders and others carrying outer-layer powders, placed in such a way that the outer powder sprays after the inner powder is sprayed and is still not gelled. The coating of the inner layer is generally fixed at 250 μm , while the thickness of the outer layer varies with the diameter of the pipe, 250 μm for 8–22 in pipe diameter and 350 μm for a pipe of diameter above 22 in.

In addition to these three main coating systems, several other coatings are also applied on pipelines. For example, for high-temperature fluids, polypropylene coating instead of PE is used. Other coatings such as liquid epoxy, polyurethane, tapes and wrappers, and now polyurea are being used for underground CCP coatings. All these four coatings mentioned, though, are commonly used for rehabilitation jobs and girth weld rather than for new pipelines.

Protection of pipeline by cathodic protection

As discussed above, coating a pipeline does not finish the protection. Complete protection requires cathodic protection (CP) also. For a CTE-coated pipe, one needs a CP station after every 10–20 km; for an FBE-coated pipe, the requirement is one CP station after every 100 km; while for 3LPE, one CP station after 200–300 km is sufficient. Also, the current requirement goes on decreasing with an increase in the quality of coating. Thus, the best coating requires low electric current to sustain effective CP. In order to maintain CP, one needs a temporary power station near CP stations. The

CP current requirement cannot be dependent on the grid power, especially for a country like India. In addition, regular monitoring of the CP station is required to know the health of the pipeline. This makes CCP corrosion protection a very interesting and challenging subject.

Field joint coatings

The field joint coatings are the coatings that are used to join individual pipes, coated in the yard, just before laying them in the ditch. Such coatings are also called girth weld coatings as these are applied on the weld joint between the two coatings. Since welds are vulnerable areas, prone to be attacked by corrosive species, they need to be coated with special care to enhance their resistance to corrosion while at the same time maintaining their compatibility with the main pipeline coating. Though there are many coatings that can be applied at field joints, such as liquid epoxy, elastomeric polyurethane, cold-applied tapes, and viscoelastic coatings, the most common and acceptable field joint coating is the heat shrink coating. These are basically the rubberized coatings that, on application and after heating shrink, hold the pipe. The first step is full cleaning of the girth weld area, followed by application of a primer epoxy coat. Uniform heating is important to make an excellent coating.

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Author: Prof A. S. Khanna, a retired Professor from the prestigious Institute, Indian Institute of Technology, Bombay, is now Chairman SSPC India, and

Technical Director of Thermogreen Cool Coat Pvt. Ltd. Prof Khanna guided 27 Ph.d's and more than 130 Master's and B. Tech projects. He has five patents and has an extensive publication list with more than 200 papers in peer reviewed international journals, through which he has got more than 4,500 citations. Prof. Khanna has received several awards. He is Fellow ASM International and NACE International, life member of Indian Institute of Metals and Society for Electrochemical Science. He is a Fellow of Humboldt Foundation Bonn and also of the Royal Norwegian Science and Technology and Fellow of Japan Key Centre.



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Prof. A. S. Khanna
Director

As per the new requirements all labs under NABL, must have a Registered Entity. As a result SECC a proprietorship company needed to be changed to a Pvt. Ltd. company. With effect from New Financial Year starting from April 1, 2024, SECC is renamed as Khanna Paint Testing Laboratory (OPC) Pvt. Ltd. We have now 54 different paint standards approved by NABL. These 54 standards include IS, ASTM, DIN, ISO, NACE, and AWWA standards. Details can be see on our website which is now www.kptllab.com The lab has the most modern, fully calibrated equipment with well-educated and trained staff.



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Polyurea coatings: Redefining standards in industrial coating technologies

The global polyurea coatings market is projected to exhibit robust growth, driven by increasing demand from construction, automotive, industrial, and infrastructure sectors

In the realm of protective coatings, one material has been making significant waves for its exceptional durability and versatility: polyurea coatings. Developed in the late 20th century, polyurea coatings have rapidly gained popularity across various industries due to their remarkable properties and wide range of applications. From industrial settings to consumer products, polyurea coatings offer unmatched protection against corrosion, abrasion, chemicals, and harsh environmental conditions. This article explores the unique features of polyurea coatings and their extensive use in enhancing durability and performance across diverse industries.

Polyurea coatings belong to the family of polyurethane plastics and are formed through the reaction of

isocyanates with an amine or hydroxyl compound. Unlike traditional coatings such as epoxy or polyurethane, polyurea coatings cure rapidly when applied, forming a seamless, elastic membrane with exceptional strength and durability. This rapid curing process, often within seconds or minutes, allows for quick turnaround times, making polyurea coatings ideal for projects requiring fast completion.

Market overview:

Polyurea coatings, known for their exceptional durability, chemical resistance, and fast curing properties, have witnessed significant growth in various industrial applications. The global polyurea coatings market is projected to exhibit robust growth, driven by increasing demand from construction, automotive, industrial, and infrastruc-



PHOTOS: 123RF

ture sectors. According to Persistence Market Research's projections, the market is expected to escalate from a value of US\$2.8 billion in 2023 to approximately US\$4.9 billion by 2030, with a compound annual growth rate (CAGR) of 7.5%.

Key features and benefits:

Superior durability: Polyurea coatings exhibit outstanding

durability, with exceptional resistance to abrasion, impact, and chemical exposure. This durability makes them suitable for protecting surfaces subjected to heavy wear and tear, such as industrial floors, pipelines, and marine structures.

Flexibility: One of the most distinctive characteristics of polyurea coatings is their flexibility. They can stretch and return to their original shape without cracking or losing adhesion, even under extreme temperature fluctuations. This flexibility ensures long-term performance and prevents delamination or failure of the coating system.

Waterproofing properties: Polyurea coatings provide excellent waterproofing capabilities, forming a seamless barrier that effectively seals surfaces against moisture ingress. This makes them invaluable for



applications in waterproofing roofs, concrete structures, and containment systems, where protection against water damage is critical.

Fast cure times: The rapid curing nature of polyurea coatings enables quick turnaround times for projects, minimizing downtime and disruption to operations. This feature is particularly advantageous in industries where downtime translates to significant financial losses, such as manufacturing, transportation, and infrastructure.

Versatility: Polyurea coatings are highly versatile and can be customized to meet specific performance requirements. They can be formulated to achieve various physical properties, including hardness, flexibility, and chemical resistance, making them suitable for a wide range of applications across different industries.

Applications across industries:

Industrial flooring: Polyurea coatings are widely used for industrial flooring applications due to their unmatched



durability and chemical resistance. They provide a seamless, easy-to-clean surface that withstands heavy traffic, impact, and exposure to chemicals, making them ideal for manufacturing plants, warehouses, and automotive facilities.

Infrastructure protection: In the construction and infrastructure sector, polyurea coatings are utilized to protect concrete and steel structures from corrosion, moisture, and chemical attack. They are commonly applied to bridges, highways, tunnels, and wastewater treatment facilities to extend the service life of critical infrastructure assets.

Pipeline coatings: Oil and gas pipelines are susceptible to corrosion and abrasion, posing significant maintenance challenges and safety risks. Polyurea coatings offer a reliable solution for protecting pipelines against corrosion, erosion, and external damage, enhancing their longevity and minimizing maintenance requirements.

Marine applications: The harsh marine environment exposes ships, offshore platforms, and marine structures to corrosion, fouling, and abrasion. Polyurea coatings provide an effective barrier against saltwater, chemicals, and UV

radiation, prolonging the service life of marine assets and reducing maintenance costs.

Automotive protection: In the automotive industry, polyurea coatings are utilized for corrosion protection, sound insulation, and bed lining in trucks and utility vehicles. Their ability to withstand impact, abrasion, and harsh

weather conditions makes them an ideal choice for protecting vehicle surfaces and underbody components.

Polyurea coatings have emerged as a leading solution for enhancing durability and performance across a wide range of industries. With their exceptional properties, including superior durability, flexibility, and fast cure times, polyurea coatings offer unparalleled protection against corrosion, abrasion, and environmental factors. From industrial flooring to marine applications, polyurea coatings continue to revolutionize the protective coatings industry, providing cost-effective solutions for extending the service life of critical assets and infrastructure. As technology advances and new formulations are developed, the versatility and applicability of polyurea coatings are expected to further expand, driving innovation and growth in various sectors worldwide.

Source: **Ajaykumar Patil**, Marketing Executive, Persistence Market Research Pvt. Ltd.;

Email: ajaykumar@persistencemarketresearch.com



Newly formed Corrosion Protection Council of India to ensure sustainable infrastructure growth

A new organization, with the objective 'to develop and implement innovative strategies and technologies aimed at achieving corrosion-free construction practices, thereby ensuring the safety, sustainability, and well-being of individuals and communities' has been launched under the banner of the Corrosion Protection Council of India (CPCI).

Upon the formation of the Council, Chairman Keshav Punj expressed his commitment to the cause, stating: "Corrosion poses a significant threat to India's economic stability, with its detrimental effects silently consuming a substantial portion of our GDP. The formation of the CPCI marks a pivotal moment in our collective effort to combat this pervasive issue and ensure the long-term resilience of our nation's

infrastructure."

CPCI has been formed in response to the present need for concerted action against the detrimental effects of corrosion on India's economy, by a group of industry leaders and experts, said Secretary Rahul Agrawal. The CPCI aims to spearhead proactive strategies to mitigate the pervasive threat of corrosion, which silently erodes the economic vitality of the nation. By advocating for preventive measures and driving awareness about the urgent need for corrosion protection, the council seeks to safeguard critical infrastructure and assets across various sectors.

The council is led by Chairman Keshav Punj and Secretary Rahul Agrawal, with vast experience in the field of corrosion protection.

Secretary Rahul Agrawal emphasizes the importance of collaboration and innovation in tackling corrosion. He remarked: "As Secretary of the CPCI, I am honored to be a part of a dynamic team dedicated to advancing corrosion protection strategies in India. By fostering collaboration between government, industry and academia, we can drive meaningful change and safeguard our economy against the corrosive forces that threaten its stability."

The CPCI is committed to leveraging its collective expertise and resources to drive policy reforms, promote technological innovations, and raise public awareness about the critical importance of corrosion protection. "One way, would be to have one-to-one meetings with contractors, authorities, civil



Mr Keshav Punj, Chairman, CPCI.



Mr Rahul Agrawal, Secretary, CPCI.

PHOTOS: CPCI

engineers, consultants, academia, etc., and with each other's help bring about more awareness on the subject," said Mr Agrawal. He emphasized that corrosion is a major concern in a country like ours with a vast coastal area. "Through collaborative efforts, the council aims to mitigate the economic drain caused by corrosion and ensure a resilient future for India's infrastructure and economy.

An awareness campaign and a drive to enroll members will be undertaken shortly, said Agrawal.

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Samir Surlaker conferred lifetime achievement award by the Waterproofers Association of India

In a glittering function attended by over 400 professionals and ethical Waterproofers, on the sidelines of the National Waterproofers Conference 2024 (NWC 2024), Mr Samir Surlaker, Director, Assess Build Chem Private Limited, was honoured by the Waterproofers Association of India (WAI) by conferring him with the coveted Lifetime Achievement Award at Le Meridien Gurgaon on September 26, 2024.

This award was presented to Mr Surlaker for his contributions to the fields of concrete technology, construction chemicals and above all to waterproofing, repair and rehabilitation. The citation to his award further states; "As a

mentor to hundreds of waterproofing professionals, Mr Surlaker has shared his vast knowledge and experience, inspiring many to reach new heights in their careers. His leadership and vision have guided the industry toward adopting modern, effective solutions for waterproofing challenges."

Mr Samir Surlaker is a Civil and Structural Engineer from VJTI with over 45 years of international experience in concrete, construction chemicals, concrete repair & protection, injection systems, waterproofing, etc. across Europe, Asia & India. Mr Surlaker pioneered the cause of manufacturing of construction chemicals in India, with a German JV in the mid-1980s.

He co-authored Handbook of Advanced Concrete Technology, ICI Handbooks on admixtures, waterproofing and industrial floorings. He is member of the Bureau of Indian Standards (BIS) and the IRC B-8 Committee for Repairs and Rehabilitation of Bridges. He is the chairman of CIDC Codes Committee for Waterproofing, Repairs and Rehabilitation.

Assess Build Chem Private Limited is a reputed manufacturer of over 200 construction chemicals and is known for its state-of-the-art technology and providing technical solutions to professionals.

Waterproofing and repair professionals are trained by Institute of International Talent Development (IITD) and



PHOTO: COURTESY

certified by Construction Industry Development Council (CIDC) under the aegis of National Skill Development Council. Mr Sunny Surlaker, Director of Assess Build Chem Private Limited and Technical Head of IITD designs courses beneficial to professional waterproofers and personnel connected to the construction chemicals. The trainers are certified by CIDC including international trainers for advanced training in injection technology.



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Lorama announces industry first: Select ColourFal Zerø[®] Colourant sets, now Green Seal Verified

Lorama Group, a leading innovator in colourant and coating solutions, has announced an industry first: Select Lorama ColourFal Zerø[®] colourant sets have achieved Green Seal verification. This prestigious designation signifies that these verified raw materials meet Green Seal's rigorous environmental standards, making them a sustainable choice for businesses committed to eco-friendly practices.

"We are thrilled to be the first in our industry to achieve Green Seal Raw Material Verification for our colourants," says Nerine Allen, Director of Regulatory

Affairs, at Lorama Group. "Sustainability is a core value at Lorama, and we are constantly striving to develop innovative solutions that minimize environmental impact. Green Seal verification status is a testament to our commitment to this principle."

Lorama's Green Seal verified raw material colourant sets offer several environmental benefits, including:

- Reduced VOC (volatile organic compound) emissions, contributing to improved air quality.
- Lower environmental impact compared to traditional colourants.



PHOTO: LORAMA

- Safe for use in a variety of applications.

With this industry-leading verification, Lorama is empowering businesses to make sustainable choices without sacrificing quality or

performance. Lorama's Green Seal verified raw material colourant sets deliver the same vibrant colours and exceptional performance that customers expect from all Lorama products.

Covestro (India) strengthens 'Make in India' vision with inauguration of production facility in Ankleshwar

Covestro (India) Private Limited, one of the leading manufacturers of high-performance polymers, has announced the inauguration of a state-of-the-art production facility at its Ankleshwar site in the state of Gujarat, India. The facility is the first of its kind in India and is a testament to Covestro India's commitment to the "Make in India" initiative, bolstering local manufacturing capabilities and contributing to India's position as a global manufacturing hub, notes a press release from the company. It will manufacture a comprehensive range of Desmodur[®] ultra trimer products, used in automotive, construction, wooden furniture, consumer electronics and more. With it, Covestro aims at meeting the

growing demand for high-performance and sustainable solutions in the coatings & adhesives industry across the Asia Pacific region. The first batch of Desmodur[®] ultra trimer product is slated for production in Q4 of 2024.

Desmodur[®] ultra trimer products are essential in the production of coatings and adhesives that offer exceptional durability and resistance to environmental factors like UV light, chemicals, and physical wear.

"This is great news for our local team and for our customers in the region. We are continuously investing in production capabilities in Asia to fortify our leading position in the Aliphatic Isocyanates business and provide high



PHOTO: COVESTRO

At the inauguration of Covestro India's state-of-the-art production facility at Ankleshwar, Gujarat.

quality products to our customers wherever they operate in the region," said Thomas Roemer, Global Head of the Coatings and Adhesives Business Entity at Covestro.

"This new investment aims to enhance the localization of

differentiated Desmodur[®] ultra trimer products, aligning with market trends for low VOC emissions, high performance, and improved efficiency in the coatings and adhesives industry," said Anand Khot, Head of Coatings and Adhesives APAC at Covestro.

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Researchers unveil novel carbon dots-driven green radiative cooling coating for energy saving in buildings

Buildings account for about 90% of Hong Kong's electricity consumption and over 60% of carbon emissions. Energy conservation in buildings is crucial for achieving climate mitigation goals. The Hong Kong Polytechnic University (PolyU) researchers have developed an environmentally friendly solar-driven adaptive radiative cooling (SARC) coating for building roofs and walls. This coating can reduce a building's surface temperature by up to 25°C and lower indoor temperatures by 2 to 3°C, all without consuming any energy. This non-toxic, metal-free and durable coating can be produced on a large scale, promoting an eco-friendly and energy-saving method to mitigate urban heat island effects and support the achievement of carbon neutrality, notes a press communique from PolyU.

Coating a building in a reflective material enables the self-regulation of its thermal environment to minimize indoor temperatures. However, traditional passive radiative cooling materials are unable to automatically adjust cooling capacity in response to environmental changes, which limits their applications. To address this challenge, a research team led by Prof Lu Lin Vivien, Professor of the Department of Building Environment and Energy Engineering at PolyU, along with key team member Dr Quan Gong, Postdoctoral Fellow of the same department, has invented a carbon dots (CDs)-driven SARC coating that can adjust cooling capacity based on

solar irradiance. This new photoluminescent radiative cooling nanocoating can convert solar energy into light energy. As solar intensity increases, the coating's solar reflectance is enhanced, preventing buildings from absorbing excessive heat.

However, traditional photoluminescent cooling materials typically rely on rare earth metals and perovskite materials, which pose environmental risks. To address these issues, Prof Vivien Lu's team has introduced groundbreaking, environmentally friendly polymer-based CDs as photoluminescent materials into radiative cooling coating. Nano-sized CDs were embedded into polymers to create a biologically harmless material. The polymer CDs were uniformly coated onto hollow glass particles to create Smart Cooling Beads, enabling the coating to effectively convert ultraviolet light into visible light photons and increase effective solar reflectance. This water-soluble SARC only requires the evaporation of water to form a coating on building surfaces without releasing any volatile organic compounds, thereby reducing air pollution.

Results have shown that, compared to conventional radiative cooling coating, the new SARC coating improved effective daytime solar reflectance from 92.5% to 95% and increased the cooling effect by 10% to 20%. For example, it can reduce the temperature by up to 25°C when applied to concrete rooftops.

In a demonstration project with the HKSAR Government department, the team applied the SARC coating to the roofs of container houses at a construction site in Hong Kong. After approximately two and a half years of continuous outdoor exposure, the coated roofs remained 24°C cooler than concrete roof under sunlight. The coating proved highly durable, with solar reflectance decreasing by less than 2% over the two-year period. Annual energy savings of 10% were achieved by reducing the air-conditioning load.

By mapping the average annual temperature drop and cooling power across different climatic regions of Mainland China, the team observed that the stronger the radiation, the greater the temperature difference the new SARC coating achieved. Taking as examples Hong Kong and ten Mainland cities—Beijing, Hangzhou, Guangzhou, Changsha, Hotan in Xinjiang, Shenyang, Guilin, Fuzhou, Chongqing and Lanzhou—the adoption of this novel cooling coating for buildings is projected to save between 97 and 136 kWh/m² of electricity annually in each city.

Prof Vivien Lu remarked, "As global warming intensifies and extreme weather events like heatwaves become more frequent, the scientific community is increasingly focused on finding ways to cool buildings while minimizing energy consumption. Our novel SARC coating demonstrates exceptional cooling performance and is suitable



The environmentally friendly SARC coating can reduce a building's surface temperature by up to 25°C and lower indoor temperatures by 2 to 3°C, without consuming any energy.

for a wide range of climates, thereby accelerating the development of next-generation cooling materials. This water-soluble coating can also be produced in various colors, allowing it to be easily applied to building roofs, walls, roadways, and urban surfaces, using paint rollers. It achieves both cooling and aesthetic enhancements and offers a promising solution for sustainable urban development and mitigating the urban heat island effect."

The team expects this dual-functional system to improve electrical power generation by 30-50% and reduce the carbon emission by 30% compared with conventional uncoated rooftops. Taking this project as an example, installation of PV over an area of approximately 600 m² on hostel rooftops can generate 97,000 kWh of electricity, resulting in annual cost savings of over HK\$120,000. The team is also developing a paraffin-based self-adaptive radiative cooling coating that can maintain appropriate solar reflectivity in response to cold and hot weather, achieving the effect of keeping warm in winter and cooling in summer.

PHOTO: HONG KONG POLYTECHNIC UNIVERSITY



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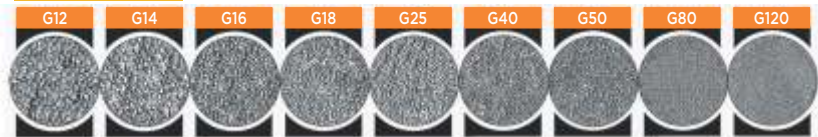


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Researchers develop a synthesis process to produce “rust-resistant” coating ideal for creating faster, more durable electronics

The future of technology has an age-old problem: rust. When iron-containing metal reacts with oxygen and moisture, the resulting corrosion greatly impedes the longevity and use of parts in the automotive industry. While it's not called “rust” in the semiconductor industry, oxidation is especially problematic in two-dimensional (2D) semiconductor materials, which control the flow of electricity in electronic devices, because any corrosion can render the atomic-thin material useless. Now, a team of academic and enterprise researchers has developed a synthesis process to produce a “rust-resistant” coating with additional properties ideal for creating faster, more durable electronics, notes a report from the Pennsylvania State University.

The team, co-led by researchers at Penn State, published their work in *Nature Communications*.

2D materials are ultra-thin, just one or a few atoms thick. They hold promise for advanced semiconductors because their thinness provides a shorter and more direct path for electrons to move quickly and with less resistance through the material. This in turn allows for faster and more efficient electronic performance.

Semiconductors are materials that conduct electricity under some conditions but not others, making them ideal for controlling electrical currents in electronic devices.

Electronic devices, the “brains” of computer chips, are made from these materials.

“One of the biggest issues that we see in 2D semiconductor research these days is the fact that the materials oxidize quickly,” said Joshua Robinson, professor of materials science and engineering and co-corresponding author of the work. “You need to ensure their long-term reliability because these are going into transistors or sensors that are supposed to last years. Right now, these materials don't last more than a week out in the open.”

Traditional methods to protect these materials from rusting involve oxide-based coatings, but these processes often use water, which ironically can accelerate the very oxidation they aim to prevent. The team's approach to this problem was to seek a coating material and method that could avoid the use of water entirely. Enter amorphous boron nitride (a-BN).

“We wanted to get away from using water in the process so we started thinking about what sort of 2D materials we can make that do not use water in its processing, and amorphous boron nitride is one of those,” Robinson said.

A non-crystalline form of boron nitride, a-BN is known for its high thermal stability and electrical insulation properties, making it ideal for use in semiconductors to insulate components, prevent unwanted electrical currents and improve device performance, Robinson said.

He explained that a-BN has high dielectric strength, a measurement indicating the material's ability to withstand high electric fields without breaking down, a critical factor for reliable electronic performance.

While the coating helped produce a better 2D transistor, getting the coating on the 2D materials proved a challenge, according to Robinson. Two-dimensional materials lack dangling bonds, which are unpaired electrons on the surface of a material that react or bond with other atoms. A standard single-step process that uses higher temperatures to coat the materials resulted in uneven and discontinuous coatings, well below the quality electronics need to function properly.

To evenly coat 2D materials with the a-BN, the team developed a new two-step atomic layer deposition method, which involves first depositing a thin low-temperature a-BN “seed layer” before heating up the chamber to typical deposition temperatures between 250° and 300°C. This not only allowed the researchers to produce an even a-BN coating over the 2D semiconductors but also led to a 30% to 100% improvement — depending on the transistor design — in transistor performance compared to devices not utilizing the a-BN.



These materials are made from molybdenum disulfide, a two-dimensional semiconductor, grown on a sapphire surface. The triangular shapes seen are aligned because of a special process called epitaxy, where the material follows the pattern of the surface it's grown on. Insulating layers, like amorphous boron nitride, are added during the process of making these ultra-thin materials, which are used to build next-generation electronic devices.

IMAGE: J.A. ROBINSON RESEARCH GROUP/PENN STATE

“When you sandwich 2D semiconductors between the amorphous boron nitride, even though it's amorphous, you end up with a smoother electronic road, so to speak, that would enable improved electronics,” Robinson said. “The electrons can go faster through the 2D material than they could if they were between other dielectric materials.”

Robinson noted that even with its high dielectric strength, researchers have only scratched the surface of a-BN's potential as a dielectric material for semiconductor devices.

“We have room for improvement even though it's already outperforming other dielectric materials,” Robinson said. “The primary thing that we're trying to do right now is improve the overall quality of the material and then integrate it into some complex structures you would see in future electronics.”

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The who's who of the painting technology industry will meet again at PaintExpo in Karlsruhe, April 14-17, 2026

PaintExpo takes place every other year in Karlsruhe as a showcase for innovations, applications, future technologies and trends covering all aspects of industrial coating. The trade fair spans the entire range of international products and services in the supply chain for industrial coating technology. The wide spectrum of products extends from spray guns, equipment and materials to automation technology. This globally unique get-together of companies from the industry is unparalleled worldwide, making it highly attractive for coating service providers and in-house coating companies from around the world. The next edition PaintExpo 2026 will take place April 14 – 17, 2026 at Karlsruhe, Germany. Mr Gerhard Ohmacht, Executive Director, Leipzig Trade Fairs on a recent visit to India to promote the event spoke with C&ACER about the show.

What according to you, have been the major achievements at PaintExpo 2024 in terms of technology introduction, in terms of participation, scale, etc?

PaintExpo 2024 marked significant technological advancements in automation, sustainability, and smart coatings. These included sustainability, to avoid CO₂ emissions; automation for the improvement of efficiency; cost reduction and also independency of energy suppliers; substitution of old drying equipment, to reduce gas consumption, etc.

We saw robust participation from across the globe. The event's continued growth in scale and international representation demonstrates its pivotal role in shaping the future of the industrial coatings industry.

How is PaintExpo 2026 shaping up?

PaintExpo 2026 is shaping up to be an exciting and crucial event for the industrial coatings industry, scheduled to take place from April 14 to 17, 2026 in Karlsruhe, Germany. This event continues to be a leading platform, attracting a global audience interested in the latest advancements and innovations in coating technologies, application methods, surface

preparation, and finishing processes.

The registration process is going quite well. More than 215 exhibitors have already registered for the next edition. That means more than 50% of the exhibitors are already on board. We expect a strong increase of exhibitors from abroad.

Any activities, new programs lined up for PaintExpo 2026 and what would they be?

For PaintExpo 2026 several activities are being lined up to keep the momentum of the event high and ensure it remains a leading platform for innovations in industrial coating technologies.

We are currently in the planning process for the next trade fair and do not want to anticipate anything. You can look forward to it. But there are no activities planned like seminars or a complete congress program. We will concentrate on offering contacts within the industry on the showground.

Why is PaintExpo a must-go-to event for the industry?

PaintExpo is considered a must-attend event for the surface coating and finishing industry for several key reasons:

1. Global industry hub

PaintExpo is the leading international trade fair focused exclusively on industrial coating technology. It attracts a wide array of exhibitors and visitors from around the world, making it a central hub for global industry players to meet, network, and collabo-



Mr Gerhard Ohmacht, Executive Director, Leipzig Trade Fairs

rate. Participants include key decision-makers, innovators, and professionals from diverse sectors such as automotive, aerospace, mechanical engineering, electronics, and furniture manufacturing.

2. Showcase of cutting edge technology

One of the biggest draws of PaintExpo is its comprehensive display of the latest innovations and technologies in the industrial coating and surface finishing space. Attendees get firsthand exposure to advancements in:

- Powder coating
- Liquid painting
- Coating pretreatment
- Automation and robotics
- Environmental sustainability, such as eco-friendly coatings.

These innovations help companies improve productivity, reduce costs, and meet stricter environmental regulations.

3. Live demonstrations and practical insights



PHOTOS: LEIPZIGER MESSE GMBH / TOM SCHULZE

Many exhibitors provide live demonstrations of equipment, systems, and processes, allowing visitors to see these technologies in action. This practical insight helps businesses evaluate new technologies and solutions that can be directly applied to their production lines, ensuring high-quality finishes and more efficient processes.

4. Networking and partnership opportunities

PaintExpo provides a unique platform for networking with professionals across the value chain—from suppliers of raw materials to manufacturers of machinery and equipment. This interaction fosters business partnerships, collaborations, and the sharing of best practices, all of which are essential for staying competitive in a rapidly evolving industry.

5. Benchmarking and competitive advantage

PaintExpo enables companies to benchmark themselves against industry leaders and competitors. By seeing firsthand what cutting-edge solutions are available, businesses can assess their own capabilities and identify areas for improvement or investment.

What are the technological trends you see happening within the coatings / corrosion mitigation industry?

The technological trends are transforming the coatings and corrosion mitigation industry by enhancing performance, increasing sustainability, and improving cost efficiency. The trends are driven by advancements in materials science, environmental regulations and the increasing demand for more durable and efficient systems.

Examples are automation and robotics in coating application, sustainability and eco-

friendly coatings (water based coatings), digitalization and smart monitoring (IoT connected coatings).

Do you feel Artificial Intelligence (AI) play a changing role within our industry?

Yes, Artificial Intelligence (AI) is already playing a transformative role in the coatings and corrosion mitigation industry, and its impact is only set to grow. AI's integration into various stages of the coating lifecycle – from formulation and application to inspection and maintenance – is changing the way the industry operates. Here's how AI is making a difference, AI-driven formulation and material development, enhanced quality control and process optimization, predictive maintenance and corrosion prevention, AI in inspection and maintenance.

AI is fundamentally reshaping the coatings and corrosion mitigation industry by making processes more efficient, precise, and sustainable. It allows companies to anticipate issues, improve product quality, and reduce costs by automating repetitive tasks, optimizing processes, and enhancing the decision-making process through data-driven insights.

How is the participation from countries in Asia, particularly India and how are you promoting the event in these areas?

Participation from countries in Asia, including India, at PaintExpo is growing steadily. PaintExpo has seen a significant international presence, with over 45% of exhibitors and more than one-third of visitors coming from outside Germany in recent editions. The increasing involvement of Asian countries, including India, reflects the region's expanding role in the industrial coating sector.

PaintExpo is strategically promoting the event in these regions by partnering with associations, magazines or conferences.

What's unique about PaintExpo, say when compared to other events around the world?

PaintExpo is a very specialized event: Unlike other broader manufacturing or surface finishing exhibitions, PaintExpo is entirely dedicated to industrial coating technologies. This highly specialized focus allows exhibitors and attendees to dive deep into all aspects of the coatings industry, from surface preparation to final coatings and post-processing.

Presence of industry leaders: PaintExpo attracts global leaders in coating technologies, including the top manufacturers, suppliers, and technology innovators. Companies present their latest products and solutions, often unveiling them at PaintExpo first. This gives attendees access to the most advanced coating technologies on the market.

It is particularly valuable for attendees looking for tailored, future-focused solutions that can enhance their processes, reduce costs, and meet evolving regulatory and environmental demands. This mix of innovation, international expertise, and industry-wide focus sets PaintExpo apart from other events around the world.



Figures (exhibitors, visitors – numbers / countries)?

PaintExpo 2024 had 430 exhibitors from more than 28 countries, and 10,400 visitors from over 88 countries.

Where do you see countries like India in PaintExpo's scheme of things?

India plays a growing and important role within PaintExpo's scheme of things, driven by its booming industrial sectors, increasing demand for advanced coating technologies, and a focus on modernization across industries. While traditionally Europe, North America, and parts of Asia (like Japan and China) have dominated the global coatings industry, India is becoming a key player in several ways.

One important reason is the growth in key industries: India's automotive, aerospace, electronics, and infrastructure industries are rapidly expanding. As these sectors grow, the demand for advanced coatings—whether for corrosion resistance, improved durability, or aesthetic quality—is increasing. This makes PaintExpo a strategic event for Indian manufacturers looking to explore cutting-edge technologies to meet both domestic and international standards.

CORCON 2024 to host over 15 technical symposia spread over 33 sessions

AMPP India Chapter is organizing CORCON-2024: 30th International Corrosion Conference & Exhibition (Asia's Largest Corrosion Conference): November 20 - 23, 2024 at Chennai Trade Centre, Chennai, Tamil Nadu, India.

Said to be Asia's largest corrosion conference, the organizers have already received over 225 technical papers and 65+ confirmed exhibitors.

CORCON is an extremely successful conference that brings together typically close to over 900 persons working in the fields of corrosion and its control. The conference is well attended with participation by academic institutions and research organizations, public and private sector organizations (including oil and gas, defense establishments and individuals). It provides an excellent opportunity for exchange of ideas, knowledge and experiences on matters concerning corrosion, learning about existing and

upcoming products and technologies and networking. As the world faces more and more with the ageing infrastructure, it is imperative for advocates of corrosion mitigation to unite and address the problem. An exhibition is also organized concurrently. Leading technologies, products and special materials are displayed in the expo.

CORCON 2024 will include:

- Symposia on various aspects of corrosion.
- Talks by eminent speakers from academia and industry around the world.
- Expo showcasing the latest products and innovative technologies (approx. 65+ exhibitors)
- Networking opportunities (900+ Delegates)
- Technical Interactive Forums (TIF)
- Workshop – Marine Corrosion in Defence Industry
- Round Table Conference – Protective Coatings and Lining Industry
- Jung Se Jung
- Young Student Scientist

Forum

- Corrosion Awareness Awards
- Portrait /Selfie booths and
- Cultural Program

The technical symposia (15) are divided into the following categories (33 Sessions):

- Cathodic & Anodic Protection
- Corrosion in Defence Sector
- Coatings Linings and Thermal Insulation
- Corrosion in Concrete and Infrastructure
- Corrosion in Oil and Gas Sector
- Corrosion Control in Water Treatment Utilities
- Corrosion in Petrochemical, Refineries and Fertilizer Industry
- Corrosion and its Mitigation in Renewable Energy Sector
- Corrosion Monitoring and Testing
- Materials and Composites
- Corrosion in Automotive Industry
- Microbial Corrosion & Inhibitors
- Corrosion in Nuclear Industry

- Marine Corrosion
- Corrosion Issues in Biomaterials
- Young Students Scientist

At CORCON 2024, the AMPP India Chapter Corrosion Awareness Awards are presented to honor and respect individuals / institutions for their contribution to corrosion awareness and development in

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NOV 20 – 23, 2024	CORCON 2024	Chennai Trade Centre, Chennai, India	AMPP India Chapter	W: corcon.org
NOV 27 – 29, 2024	COAT INDIA 2024	Yashobhoomi, Dwarka New Delhi, India	ACEXM7 Events Pvt Ltd	E: support@acem7.com W: coatindia.in
DEC 03 – 05, 2024	CHINACOAT 2024	China Import & Export Fair Complex, Guangzhou, China	Chinacoat Exhibition Ltd	W: chinacoat.net
JAN 15 – 17, 2025	THE COATINGS SUMMIT	Andaz Hotel, Singapore	Vincentz Network	W: european-coatings.com
JAN 30 – 31, 2025	PAINTINDIA 2025	IICC (Yashobhoomi), Dwarka, New Delhi, India	ExpoNova	Email: paintindia.expo@colorpub.in W: paintindia.in
FEB 15 – 18, 2025	BIG5 CONSTRUCT SAUDI	Riyadh, Saudi Arabia	dmg events	W: big5constructsaudi.com
FEB 23 – 25, 2025	EGYPT COATINGS SHOW	Egypt International Exhibition Center, Cairo, Egypt	dmg events	T: +971 44453773 E: paddyoneill@dmgevents.com W: egyptcoatingsshow.com
FEB 24 – 26, 2025	CENTRAL ASIA COATINGS SHOW	IEC Astana Expo, Astana, Kazakhstan	United Expo	E: unitedexpo@gmail.com W: centralasiacoatingsshow.com
FEB 25 – 28, 2025	INTERLAKOKRASKA 2025	Expocentre Fairgrounds, Moscow, Russia	Expocentre	E: interlak@expocentr.ru W: interlak-expo.ru/en/
APR 06 – 10, 2025	AMPP ANNUAL CONFERENCE + EXPO 2025	Music City Center, Nashville, Tennessee, USA	AMPP	W: amp.org
MAY 13 – 15, 2025	SAUDI ARABIA COATINGS SHOW 2025	Dhahran Expo, Dammam, Saudi Arabia	dmg events	T: +971 44453773 E: paddyoneill@dmgevents.com W: saudiarabiacoatingsshow.com
MAY 13 – 15, 2025	EASTERN COATINGS SHOW	Harrah's Atlantic City, NJ, USA	The Philadelphia Society for Coatings Technology	E: info@easterncoatingsshow.com W: easterncoatingsshow.com
JUN 25 – 27, 2025	COATINGS EXPO VIETNAM 2025	SECC, Ho Chi Minh City, Vietnam	VEAS	E: info@veas.com.vn E: coatings-vietnam.com
JULY 02 – 04, 2025	WEST AFRICA COATINGS SHOW	Landmark Centre, Lagos, Nigeria	dmg events	T: +971 44453773 E: paddyoneill@dmgevents.com W: westafricacoatingsshow.com
SEP 03 – 05, 2025	ASIA PACIFIC COATINGS SHOW	Bangkok International Trade & Exhibition Centre Bangkok, Thailand	dmg events	T: +971 44453773 E: paddyoneill@dmgevents.com W: asiapacificcoatingsshow.com
OCT 01 – 03, 2025	PAINTEXPO EURASIA	Istanbul Expo Centre, Istanbul, Turkey	Artkim	E: sales@artkim.com.tr W: artkim.com.tr

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at Consulting Services Department
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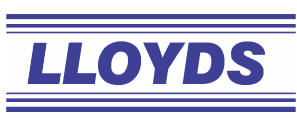
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