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COATINGS AND ANTI CORROSION ENGINEERING REVIEW

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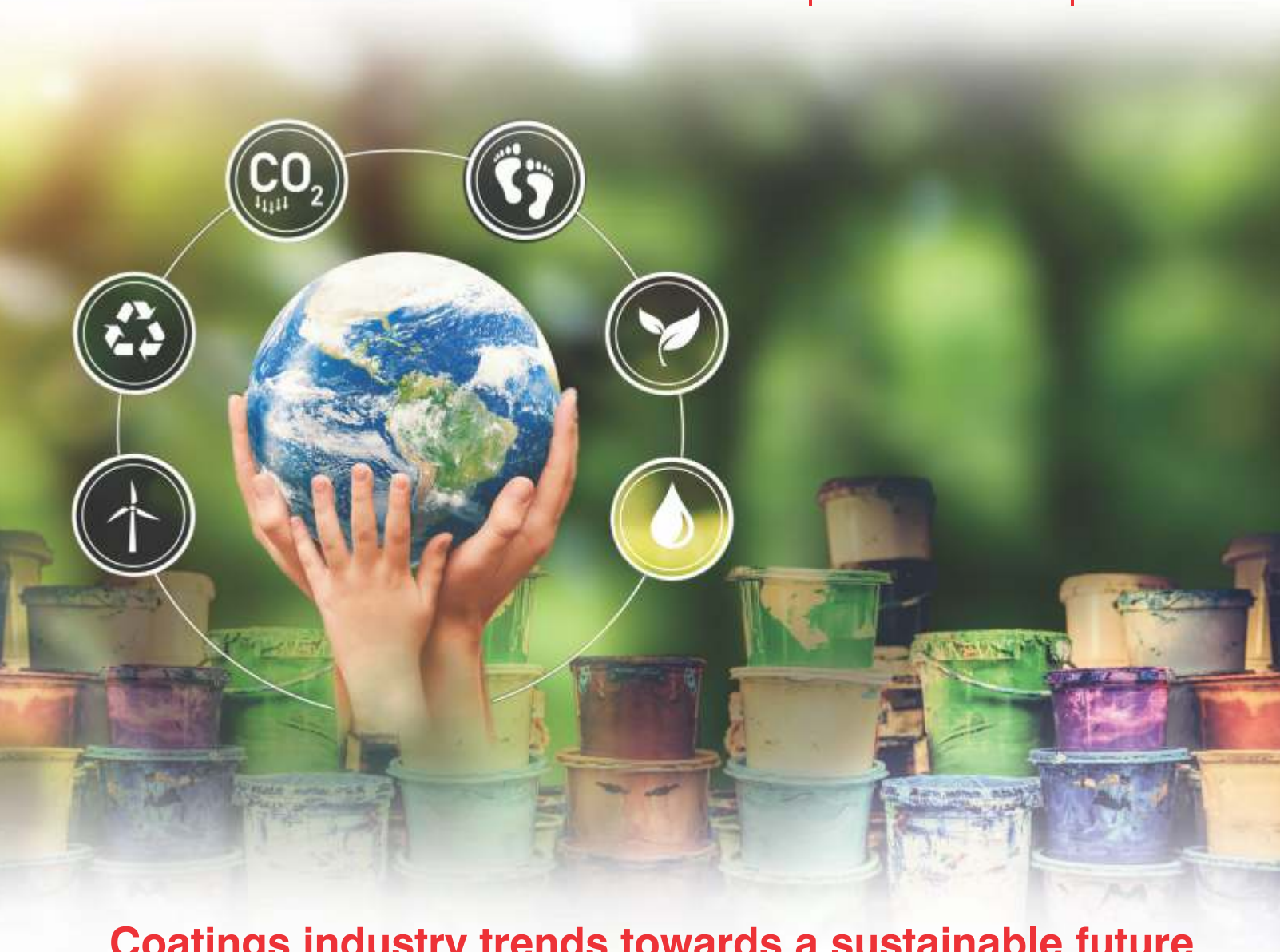

Coatings industry trends towards a sustainable future

Interview

Rogelio De Las Casas

Principal Consultant, DeLasCasas CP, LLC

Technical Feature

Pre-adsorbed Selektope®

Creation of a new carrier system for Selektope® via pre-adsorption on Zinc Oxide for enhanced antifouling performance

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PIPELINE COATINGS

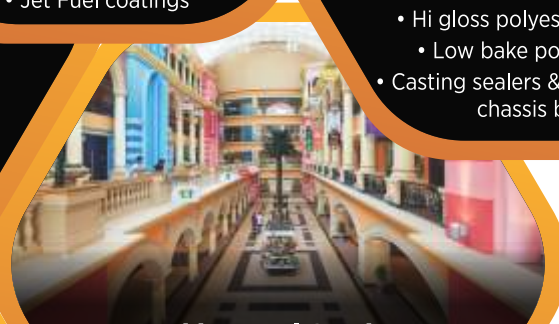
- Heavy duty coatings for chemicals & petroleum industries
- Coating systems for thermal power, wind & nuclear power plants
- Food grade epoxy linings
- Gas flow epoxy coatings
- Jet Fuel coatings

MARINE COATINGS

- Marine enamels & epoxy coatings
- Prefabrication primers
- Ballast tank coatings
- Under water coatings
- Antifouling coatings

OEM COATINGS

- Quick drying primer & top coats, low bake & stoving systems
- Thermosetting acrylics
- Hi gloss polyester top coats
- Low bake polyurethane
- Casting sealers & unicoat epoxy chassis black



Architectural Coatings

- External coatings
- Internal coatings
- Hygiene coatings
- Anti carbonation coatings

FLOOR COATINGS

- Penetrating Primer
- Screed
- Solvent less Epoxy
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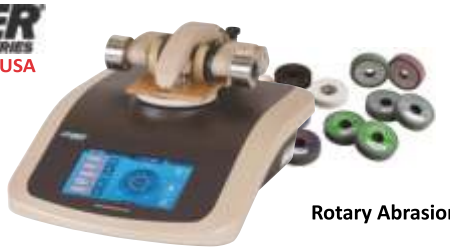

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Now is a great time to automate your finishing process

COVER PHOTO: 123RF

COATINGS AND ANTI CORROSION ENGINEERING REVIEW

From the Editor-in-Chief...

Volume 14; Issue 4
October - November 2023

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Years ago, green or sustainable coatings were deemed eco-friendly coatings that emit almost negligible or zero volatile organic compounds (VOCs) during the production and application processes. This definition has now been extended to include sustainability aspects.

There are three major elements that drive the coating industry towards sustainability: Health, Climate Change, and Circular Economy. These entail a plethora of activities like energy and resource conservation, waste minimization, process efficiency enhancement, use of renewable materials, etc.

Industries have come to understand the importance of sustainability and are now moving towards a sustainable future. The coating industry is also following the lead and innovating. Companies are now also considering the societal impacts of their activities that impact the entire value chain. In recent years, the emphasis on environmental regulations has risen globally. Governments across the world are aiming to reduce pollution and promote sustainable practices.

The increasing prioritization of sustainability by both businesses and consumers is predicted to bolster market expansion in the coming years. By improving the durability of assets, the industry is supporting extended product lifecycles, circularity and reuse, while preserving both renewable and non-renewable sources for generations. The coating industry is constantly innovating and developing new technologies to create more sustainable and high-performance coatings. Advancements in research have led to the formulation of green coatings with improved characteristics such as enhanced adhesion, durability, and weather resistance. As a result, the expanding application range is likely to augment the demand for green coatings.

The increasing construction activities are anticipated to amplify the demand for green coatings, as they contribute to better indoor air quality and healthier living and working environments. The automotive sector too has been witnessing a consistently growing product penetration and exponential growth in their products and innovations. In this issue, we try and analyse what is happening on the sustainable front with regards to our industry and what they feel is the way forward. Plus, all our regular features, and columns.

Let me also take this opportunity to wish you all a very happy, prosperous and festive season ahead!!!

Jolly Lonappan
Editor-in-Chief

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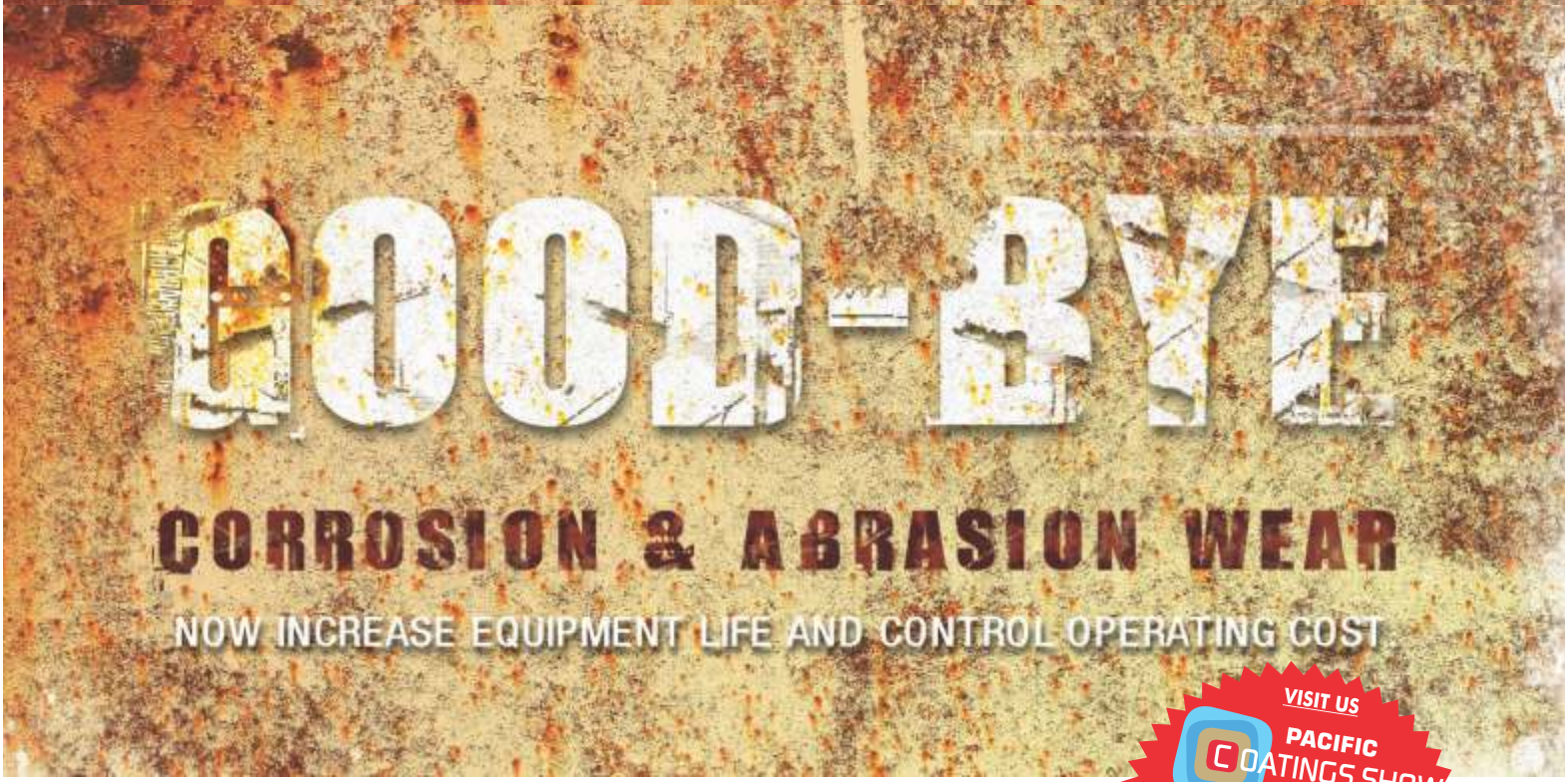

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CORROSION, ABRASION & CHEMICAL ATTACKS destroy crores of rupees worth equipment every year. Worldwide research shows that nearly 70%-80% equipment failures are purely due to their surface erosion. The need for effective preventive maintenance therefore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

Aluma Coat® - TW

A trowelable, easy to apply protective coating, comprising of sintered sapphire-hard ceramic micro beads, doped in polymer resins designed to resist corrosion, abrasion and moderate surface impact. It gives a rough textured surface finish and can withstand maximum service temperature up to 150°C / 302°F.

Aluma Coat® - TW

Mineral Crusher Coated with Aluma Coat - TW

Inner Base of Dust Collector Coated with Aluma Coat - TW

Aluma Coat® - BR

A brushable / sprayable easy to apply coating designed to protect surfaces from severe turbulence, corrosion, erosion and chemical attacks. It gives a satin smooth, high-gloss surface finish and can withstand maximum service temperature up to 150°C/ 302°F

Aluma Coat® - BR

Motor Shaft Coated with Aluma Coat - BR

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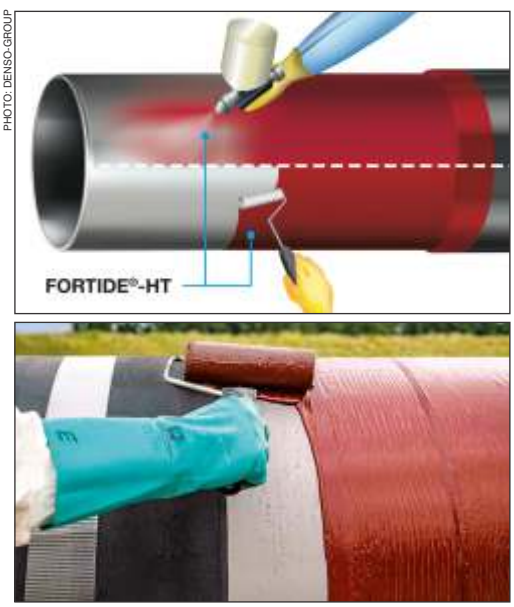
FORTIDE® epoxy coatings new in DENSO'S portfolio

With its various corrosion protection systems, DENSO Group Germany has been setting quality standards on countless pipeline projects worldwide for a century. Under the brand FORTIDE®, DENSO Group Germany is expanding its range to include high-performance epoxy coatings. To meet the diverse, ever-increasing demands of pipeline construction, FORTIDE® offers durable corrosion protection for a wide range of applications in tough conditions.

PHOTO: DENSO GROUP



FORTIDE®-HT - High Temperature, is ideal for corrosion protection of pipelines at maximum operating temperatures of up to +150 °C, for pipes transporting particularly hot media or exposed to very high ambient temperatures.

FORTIDE® is suitable for the rehabilitation of pipelines, as a whole pipe coating or for welded joints and complex geometries. The products are characterized by an outstanding coating hardness and exceptional indentation strength. As a brush or spray coating, they are simply applied to the surface in one step, even in high layer thicknesses. FORTIDE® is free of volatile solvents and isocyanates. "Epoxy coatings are highly tensile, chemically resistant, fast curing and therefore ensure early commissioning of the pipeline. In addition to its versatile applicability, FORTIDE® meets our demands for simplicity, economy and durability and guarantees what our customers especially appreciate about DENSO: the proven quality Made in Germany," says Thomas Kaiser, Managing Director of DENSO Group Germany.

Denso offers four product solutions for a wide range of applications

FORTIDE®-HT - High Temperature: Corrosion protection of pipelines at maximum operating temperatures of up to +150 °C. For pipes transporting particularly hot media or exposed to very high ambient temperatures.

FORTIDE®-ST - Standard Temperature: Corrosion protection for pipelines at operating temperatures up to +95 °C.

FORTIDE®-TL - Tank Lining: Internal coating for tanks and pipelines with exceptional chemical and water resistance, e.g. against crude oil, various hydrocarbons, acids, lyes and waste water.

FORTIDE®-WS - Wet Surface: Specifically for use on wet surfaces, which are often a challenge, for example, when rehabilitating old coatings during pipeline operation.

"Along with FORTIDE®, we cover all relevant corrosion protection systems with DENSO® Petrolatum tapes, DENSOLEN® PE/Butyl tapes, DENSOLID® Polyurethane coatings, DEKOTEC® Heat shrinkable sleeves and the universally applicable SEALID® All-in-1, among others. This scope of our product portfolio for passive corrosion protection of pipes and pipelines is unique in the market. We are proud of this," explains Max Wedekind, Managing Director of DENSO Group Germany.

Disolac Water Based for corrosion, UV and chemical protection

Disolac, Roberlo's (disolacwaterbased.roberlo.com) industrial coatings brand, introduces Disolac Water Based, the water-based tintometric system especially for the industrial sector designed to be more sustainable while also maintaining the excellence and reliability of the traditional Disolac system, notes a press release from the company.

Respect for the health of professionals and the environment are two key elements that have been considered while developing Disolac Water Based. According to tests carried out in accordance with the UNE-EN 689 2019 standard, using this system reduces exposure to components harmful to human health and the environment, compared to conventional systems.

This water-based technology maintains the same excellence in quality and efficiency as the traditional system. In accordance with ISO 12944, it also provides the substrate with optimum corrosion protection, UV and chemical protection and ensures maximum durability with an impeccable glossy finish.

Disolac Water Based is a hybrid system that allows the different coating layers to be combined with a traditional system, offering the versatility required in each project. It also has a color service that produces custom colors and makes use of leading color tools in the industry, such as color charts and iCrom color management software, with more than 19,000 formulas, which are updated periodically.

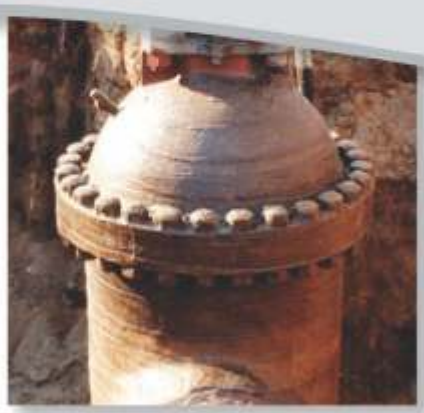
The sectors it can be used in are as wide as the number of surfaces to be coated: from structural coatings, refinishing of industrial vehicles and construction and agricultural machinery, to lettering and signage, to maintenance and home maintenance.

PHOTO: ROBERLO

Respect for the health of professionals and the environment are two key elements that have been considered while developing Disolac Water Based.

Trenton offers three Wax-Tape® brand anticorrosion wrap systems.

High-quality, easy-to-apply wraps that protect irregularly shaped fittings and require minimal surface preparation.



Belowground applications

Wax-Tape® #1

Anticorrosion Wrap:
A very durable wrap that uses a thick, non-stitch bonded synthetic fabric and has no clay fillers, so it stays conformed to irregular profiles. The wrap requires no abrasion blasting, can be backfilled immediately and is compatible with cathodic protection.

Aboveground and belowground applications

Wax-Tape® #2

Self-Firming Anticorrosion Wrap:
A unique, microcystalline-wax-saturated wrap that slowly firms up to provide excellent aboveground and belowground protection. Comes in a variety of colors and usually requires no outerwrap.

High-temperature applications

Wax-Tape® HT-3000

High-Temperature Anticorrosion Wrap:
Designed for operating temperatures up to 230°F (110°C), Wax-Tape® HT-3000 wrap can be used on high-temperature oil and gas piping, on compressor station discharge piping, beneath thermal insulation and in high ambient temperature conditions.

Only Trenton offers Wax-Tape® brand anticorrosion wrap systems, with primers, wraps and outerwraps.

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New silicone resin binders for heat-resistant coatings from Wacker

WACKER (wacker.com), the Munich-based chemical company, presents two new silicone resin binders: SILRES® M 51 E and SILRES® IC 900. Both products are suitable for manufacturing industrial coatings that can withstand high temperatures, notes a press release from the company. While SILRES® M 51 E has been designed for formulating water-based coatings, SILRES® IC 900 is a methyl phenyl silicone resin for thick-film and high-solids coatings that remain stable at high temperatures. Both binders can be processed to make coatings that, after baking, adhere well to metallic materials such as steel or aluminum and can withstand temperatures of up to 600°C given suitable pigmentation.

PHOTO: FENZI

Cross-cut tests show that the adhesive properties of SILRES® M 51 E are similar to those of high-temperature paints and coatings formulated with solvent-based silicone resin binders.

SILRES® M 51 E is a functional methyl silicone resin finely dispersed as tiny droplets in an aqueous medium. Using this kind of formulation for application on metal substrates is novel. The properties of water-based paints in which SILRES® M 51 E is the sole binder are similar in quality to those of heat-resistant coatings containing solvent-based silicone resin binders. Aqueous paint formulations dry quickly and, after baking, possess exceptional chemical and mechanical strength. Following thermal stress, coatings show excellent color and gloss resistance.

Components coated with the resulting water-based paint can be processed quickly – the surface is tack-free just fifteen minutes after application, making the coating process highly efficient. In addition, coatings based on SILRES® M 51 E produce significantly less smoke when first heated than is the case with comparable heat-resistant water-based paints. This allows paints and coatings manufacturers to formulate products that release far lower quantities of volatile organic compounds (VOCs) than their solvent-based counterparts. Typical applications include vehicle exhaust systems, ovens and stoves, range hoods, fireplaces, pots and pans, as well as pipes and plant components in the petrochemicals industry.

SILRES® IC 900 was developed as a binder for solvent-based paints and coatings that have to withstand high temperatures. The product can even be used for formulating high-solids coatings.

SILRES® IC 900 is a silicone resin binder for high-temperature applications that permits dry-film thicknesses of over 100 micrometers. Thick-film coatings like these do an especially effective job of protecting the metallic substrate. They are also easier to use than conventional coatings, which have to be applied in relatively thin layers of consistently uniform thickness. Thick-film coatings make maintenance work easier to perform, especially in difficult-to-access areas.

Coatings based on SILRES® IC 900 can be formulated as either one- or two-component products. Upon curing, these coatings are highly resistant to chemicals, and their color remains stable. SILRES® IC 900 provides reliable protection from corrosion, particularly in chemical plants and piping systems subject to exceptional thermal stress.

DRYPRIM EF26, dry-on-dry powder coating made simple

DRYPRIM EF26 from Protech Oxyplast (theprotechgroup.com) is a primer that excels in simplicity. Thanks to powder-in-powder technology, DRYPRIM offers the benefits of a two-layer coating system, but only needs one stoving cycle to unleash its full potential, notes a press release from the company.

After the application of the two layers of (dry) powder, both powder layers are baked together in the same stoving cycle, which eliminates the step of intermediate baking of the primer.

The major advantage of this two-in-one system is that it can be applied with standard spray equipment and with standard topcoats available from stock!

DRYPRIM excels in intercoat adhesion, superior corrosion protection and edge coverage. Due to its energy reduction, this system fits perfectly into the Green Label program.

DRYPRIM gives the best results with the PE40FE low-bake, degassing topcoat. However, other topcoats can be tested and approved by Protech-Oxyplast upon request.

PHOTO: PROTECH OXYPLAST

DRYPRIM excels in intercoat adhesion, superior corrosion protection and edge coverage.

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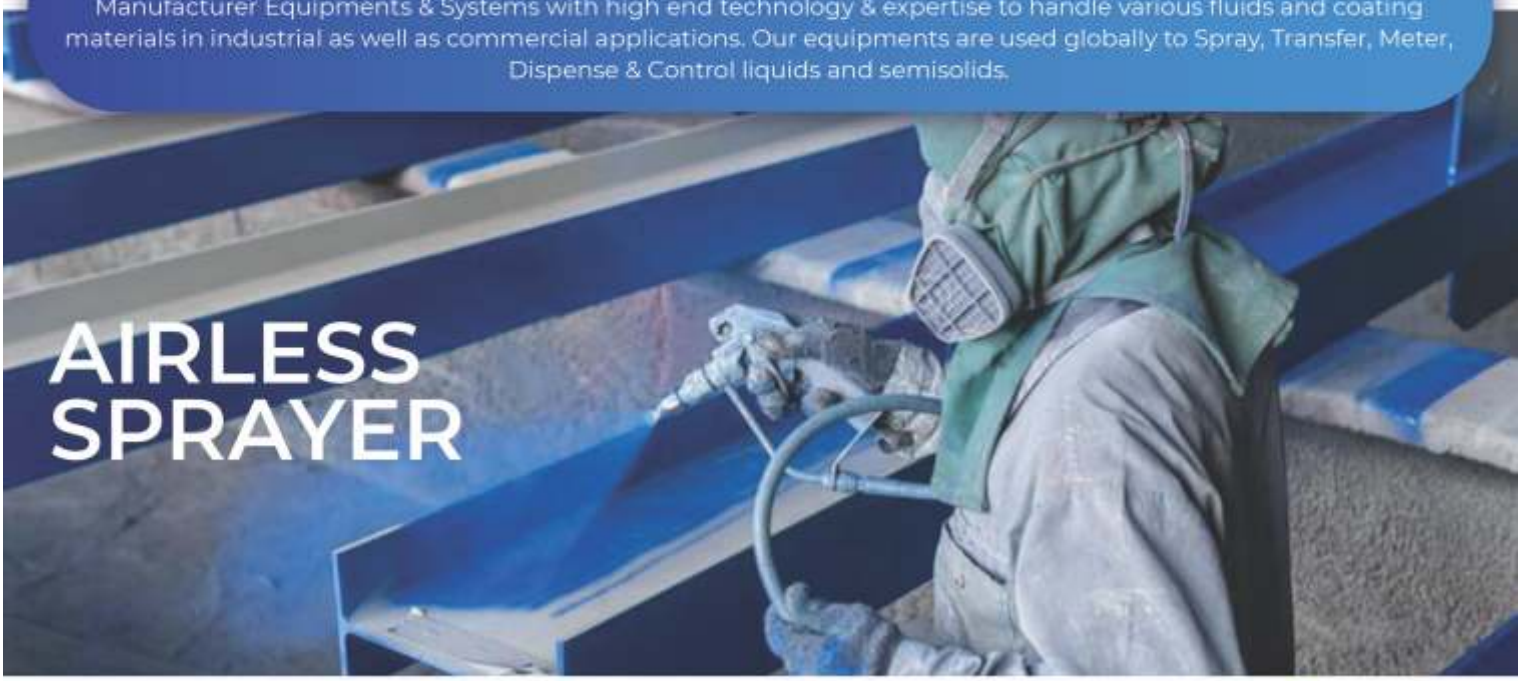

C-301

Pneumatically Operated Airless Paint Sprayer

Specifications and Features :

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- Ratio : 30:1
- Power Source : Air
- Fluid Pressure Max.(Kg/Cm2): 210/3045 PSI
- Lightweight spray painting machines designed for quick and easy setup.
- Applications- Heavy Fabrication,Foundries Injection Grouting, Transport Vehicles.

C-451

Pneumatically Operated Airless Paint Sprayer

Specifications and Features :

- Model : C-451
- Ratio : 45:1
- Power Source : Air
- Fluid Pressure Max.(Kg/Cm2): 315/4567.5 PSI
- Easily Detachable Suction Port reduces Cleaning & Maintenance Time
- Applications - PEB Structural coating, Bridges & Roof coating, Rail Car etc.

C-631

Pneumatically Operated Airless Paint Sprayer

Specifications and Features :

- Model : C-631
- Ratio : 63:1
- Power Source : Air
- Fluid Pressure Max.(Kg/Cm2): 378/5481 PSI
- Suitable upto 100% volume solid paint and coatings.
- Applications - Offshore/Onshore Ind., Corrosion preventive coating, Refinery.

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Kraton introduces Nexar™ anti-fog coatings and films to revolutionize protective eyewear market

Kraton Corporation (nexar-antifog.com), a leading global sustainable producer of specialty polymers and high-value biobased products derived from pine wood pulping co-products, has introduced Nexar Anti-Fog coatings and films, a solution designed to address persistent fogging issues experienced by healthcare professionals when using personal protection equipment (PPE) such as face shields and eye protection, notes a press release from the company.

PHOTO: 123RF

Through extensive research and innovation, Kraton has developed Nexar Anti-Fog coatings and films, offering a cutting-edge solution to the fogging problems commonly associated with certain PPE.

Through extensive research and innovation, Kraton has developed Nexar Anti-Fog coatings and films, offering a cutting-edge solution to the fogging problems commonly associated with certain PPE. Traditional face shields and goggles are prone to fogging, causing discomfort, and hindering clear vision during critical procedures. Nexar Anti-Fog technology helps provide healthcare workers with a superior solution that allows for prolonged, fog-free eyewear, ensuring uncompromised visibility.

"As a company committed to the well-being of healthcare workers and patients, Kraton understands the importance of clear vision in delivering exceptional care," said Jeff Mathers, General Manager at Kraton. "We are proud to introduce Nexar Anti-Fog coatings and films, which address the daily challenges healthcare professionals face. Our advanced technology enables healthcare workers to work comfortably with prolonged vision clarity, making their daily tasks safer and more efficient."

Nexar Anti-Fog coatings and films incorporate highly advanced technology that sets a new standard for protective eyewear. The solution combines hydrophobic and hydrophilic segments to effectively remove moisture that causes fogging while providing exceptional strength and flexibility as a coating or a film. The specialized nanochannels integrated into the coating and film surfaces can swiftly capture and absorb moisture upon contact, leaving no time for fog to form. Remarkably, the Nexar technology can absorb over 200% of its weight in water, surpassing conventional technologies like Polyvinyl Alcohol (PVA), which typically absorb less than 45% of its weight. Additionally, Kraton's commitment to safety is evident in the absence of per- and poly-fluoroalkyl substances (PFAS) — "forever" chemicals found in many antifog options, providing the industry with an environmentally friendly and sustainable alternative.

Kraton's Nexar Anti-Fog coatings and films represent a significant leap forward in protective eyewear anti-fogging capabilities. The revolutionary technology provides healthcare professionals with a reliable, high-performance solution, offering prolonged crystal-clear vision and enabling worker safety, the press release notes.

Flexiproof 100/UV - RK Print Coat Instruments

The FlexiProof 100 from RK Print Coat Instruments offers a high speed, operator-friendly machine for the production of proofs using water, solvent or UV flexographic inks, notes a press note from the company. It is an essential tool for all those involved in the manufacture and use of flexo inks, ideal for quality control testing to ensure consistency of performance of inks and substrates over time, presentation samples, printability of substrates, R&D including product and commercial viability, and computer color matching data.

The Flexiproof 100/UV can be used to determine performance properties, i.e. wear resistance, scratch resistance, flexibility, durability, gloss, etc.

Features include: Printers that eliminate press downtime by color matching off press; can be used to determine performance properties, i.e. wear resistance, scratch resistance, flexibility, durability, gloss, etc.; will print on all typical commercial substrates – paper, film, foil; minimizes expensive on-press waste production, boosts customer confidence and minimizes customer returns; inks – computer color matching, database and sample preparation; eliminates the need to use a production line printing press for pilot runs, as the Flexiproof 100 is a scaled down but exact version of a full sized flexo press; research and development – product viability, commercial viability; available with UVLED curing capabilities.

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JAS-ANZ M5000712ID

PPG's SEM Products launches GLADIATOR XC Matte Extreme coating for the refinish and industrial aftermarkets


PHOTO: PPG

PPG's SEM Products business has launched GLADIATOR™ XC Matte Extreme protective coating for the refinish and industrial aftermarkets.

PPG (ppgrefinish.com) has announced that its SEM Products business has launched GLADIATOR™ XC Matte Extreme coating, a premium, low-gloss urethane protective coating that can be used in industries and applications including automotive, light industrial, marine, RVs, emergency vehicles, and recreational equipment.

Gladiator XC coating has a tough, textured, low-gloss matte finish that is durable and flexible. It features a long shelf life, quick curing time, superior fade resistance and UV stability, and meets VOC regulations in all U.S. states. It also meets the key test used by the ASM International standards organization to qualify a coating's resistance to cracking once applied and cured on sheet metal or on other flexible materials.

"Gladiator XC Matte Extreme coating can be used for truck beds, trailers, and other products in the refinish market and its use extends to other industries and applications," said Meghan Barrera, PPG business director, allied products, Automotive Refinish. "It combines the benefits of a premium product at a competitive price point and is easy to use, making it ideal for many aftermarket applications."

Gladiator XC can be applied using a spray gun, brush, or roller. It is available in both black and clear tintable bulk and kit sizes.

BASF broadens its monomers portfolio and launches bio-based 2-Octyl Acrylate

BASF (basf.com) is expanding its growing portfolio of 14C bio-based monomers with a proprietary process for production of 2-Octyl Acrylate (2-OA). The new product underlines BASF's strong commitment to innovation for a sustainable future with 73% 14C-tracable bio-based content according to ISO 16620, notes a press release from the company. Besides the regular 14C bio-based 2-Octyl Acrylate, BASF also launched the new product as 2-Octyl Acrylate BMB ISCC Plus. Here, the remaining carbon content is ISCC PLUS certified, and by applying BASF's biomass balance (BMB1) approach, this variant offers a further reduced product carbon footprint (PCF2).

"We have broadened our product portfolio to support customers on their sustainability journey. With 2-OA, we are proud to have launched a novel acrylic monomer that helps customers to meet their sustainability goals," says Dr Reiner Geier, Senior Vice President Industrial Petrochemicals Europe.

BASF's 2-Octyl Acrylate uses 2-Octanol as the respective bio-based feedstock. This bio-alcohol is based on castor oil, a sustainable non-edible feedstock which is reliably available throughout the year.

With its balanced solvency, 2-Octyl Acrylate can easily be used as bio-based alternative to fossil-based monomers such as 2-Ethylhexyl Acrylate (2-EHA) and n-Butyl Acrylate (BA) e.g. in adhesives formulations, or coatings applications.

The new product also offers performance benefits compared to fossil alternatives, showing improved scrub resistance in coatings, shear resistance in adhesives and excellent weatherability. Therefore, 2-Octyl Acrylate is one of the few 14C bio-based monomers which can be used in both standard and high-performance applications. The high purity of BASF's 2-Octyl Acrylate provides a reliably high quality, with low volatile organic compounds (VOC) and enables customers to use the monomer in a broad application range.

Wagner Spraytech announces cordless FLEXiO 3550 18v Paint Sprayer

Wagner® SprayTech (wagnersprayTech.com), a market leader in advanced paint applicators and tools, has announced the FLEXiO 3550 18V, Wagners' first cordless paint and stain sprayer.

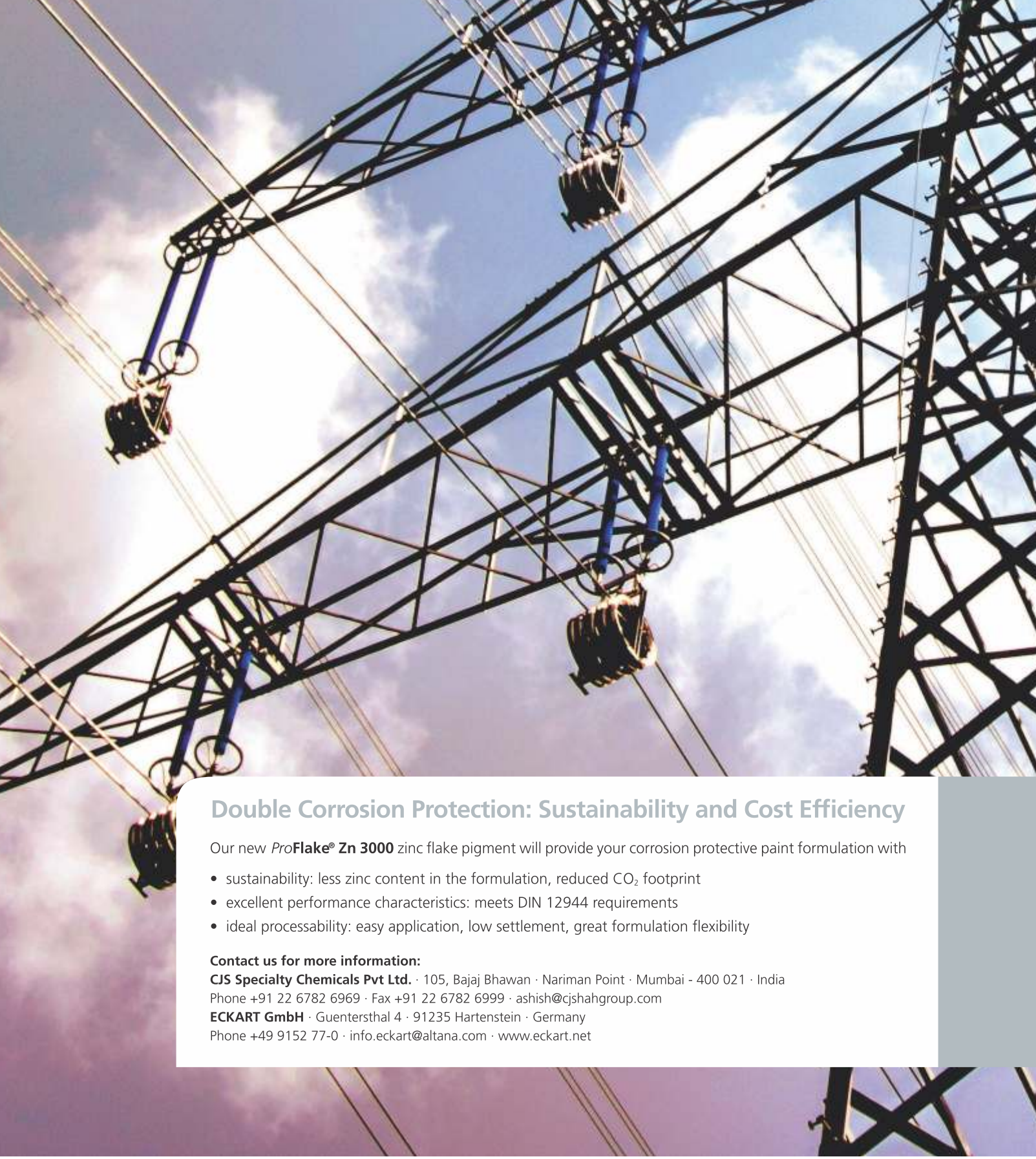
"The FLEXiO 3550 18V provides ultimate portability and the ability to spray paints and stains in any location," said Jon Beaton, vice president of Product Management at Wagner. "This new sprayer provides more freedom and flexibility than a corded sprayer so you can spray objects not easily accessed with a corded sprayer, such as children's outdoor playsets, fences around the yard, gazebos and more."

The FLEXiO 3550 18V delivers a smooth, consistent finish with most unthinned paints and stains. A single charge of the 18V 2.0 Ah lithium-ion battery provides sufficient power to paint two 8 x 8-foot walls or stain a 40 x 6-foot fence. The battery and sprayer have charge-status indicators for quick reference of battery usage.


PHOTO: WAGNER® SPRAYTECH

The Wagner® SprayTech cordless FLEXiO 3550 18V paint and stain sprayer.

Like the other versatile sprayers in the FLEXiO series, the FLEXiO 3550 18V features multiple adjustable settings, including an adjustable flow control, spray width, spray pattern and variable speed power settings displayed on the LED panel. It comes standard with two nozzles: the iSpray nozzle for spraying broad surfaces like small sheds and fences that aren't near outlets, and a Detail Finish nozzle for spraying a smooth, fine finish on projects such as light touch-ups on trim or furniture.



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In war against industrial corrosion, clean lasers prove very effective

Clean technology lasers offer superior industrial corrosion removal in myriad applications, helps solve some of industry's most costly corrosion problems

Industries have been fighting a war against corrosion in metal infrastructure, equipment, and products at great expense for generations. "The global cost of corrosion is estimated to be US$2.5 trillion, which is equivalent to 3.4% of the global Gross Domestic Product (GDP) (2013), according to a NACE International IMPACT study to examine the current role of corrosion management in industry and government and to establish best practices.

Given the massive industrial outlay, proactively controlling corrosion is imperative and can have an equally impressive ROI.

"By using available corrosion control practices, it is estimated that savings of between 15 and 35% of the cost of corrosion could be realized, i.e., between US$375 and $875 billion annually on a global basis…The fact that corrosion control provides a cost benefit is a lesson learned over and over again by industry, often too late and following catastrophic events," continues the NACE International IMPACT study.

However, traditional methods of removing corrosion can be messy, laborious, time consuming, and can even pose serious health hazards.

Today, one of the easiest to use and most effective alternatives in the war against corrosion is the increasingly important category of industrial-grade, clean technology lasers.

PHOTOS: LASER PHOTONICS

Clean technology lasers offer superior industrial corrosion removal in myriad applications, helping solve some of industry's most costly corrosion problems.

CleanTech laser systems can last for 50,000 to 100,000 hours with virtually no maintenance needed after purchase and no consumables required.

With this approach, precision laser-based systems are used to remove corrosion, contaminants, paint, and residues with a high-energy laser beam that leaves the substrate unaffected. Preparation and cleanup time are minimal, and the low-maintenance equipment can last decades. The technology minimizes operator exposure to potential environmental health hazards. In addition, no consumables are necessary.

Corrosion and the limits of conventional control

Any industry with metal infrastructure, processing equipment, or products exposed to water, fluids, moisture, or atmospheric humidity continually fights corrosion, which causes the deterioration and loss of a material and its critical properties due to chemical, electrochemical reactions of the exposed surface with the surrounding environment. Corrosion affects the microstructure, mechanical properties, and physical appearance of the materials.

The direct cost of corrosion includes a loss of materials, equipment, and production, plus the cost of repair, maintenance, and replacement. Additional losses can result from accidents, injuries, and even loss of life as well as payments to repair environmental damage.

Within the continual struggle against industrial corrosion, one important niche area of corrosion control involves the pretreating of metal surfaces to remove corrosion and contaminants before coating or welding.

Although metal surface pretreatment is a small portion of industrial corrosion control, it is crucial to ensure the safety, performance, and longevity of products and structures.

Insufficient coating pretreatment can lead to inadequate protection from the environment, leading to potential coating failure, moisture entry, and accelerated corrosion as well as increased maintenance, early replacement, and warranty issues. Similarly, insufficient weld pretreatment to remove corrosion and contaminants can lead to weakened or failed welds and necessary rework as well as substantial safety, liability, and litigation risk.

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Preparation and cleanup time are minimal, and the low-maintenance equipment can last decades.

The technology minimizes operator exposure to potential environmental health hazards and no consumables are necessary.

A more effective weapon to eliminate corrosion

In many industries, it is necessary to remove corrosion, residue, oil, grease, or paint before coating a product or infrastructure to improve coating adhesion.

Toward this end, laser-based systems have significant advantages over traditional methods, starting with ease of use.

"With laser-based systems, an operator simply points and clicks a high-energy laser beam at the surface. The substrate is not affected by the laser, and the systems do not create any mess or byproducts. The approach is eco-friendly, energy-efficient, and completes the job in approximately half the time of traditional methods when preparation and cleanup are considered. Also, no consumables are required," says Wayne Tupuola, CEO, Orlando, Florida-based Laser Photonics, a leading provider of patented industrial grade CleanTech® lasers for cleaning and surface conditioning. The company's systems function either as mobile standalone units or can be integrated into production lines.

In the case of Laser Photonics, the laser systems are available in portable and stationary models ranging from 50 to 3,000-watts (a 4,000-watt version is in development) with chamber sizes from 3' x 3' in size to 6' x 12'. The systems can also be installed in manufacturing lines in cabinets or operated by a robotic arm.

In industry, the laser pretreatment of metal surfaces can be used to streamline various manufacturing processes. For instance, it has been used to remove rust from hundreds of automotive transmissions per day. It has also been utilized to eliminate corrosion from conveying system components.

The CleanTech lasers are also used to refurbish industrial infrastructure, such as when removing a previous coating along with any corrosion to facilitate the new coating's adhesion to the surface.

Another common laser application involves pre-weld treatment to remove corrosion, mill scale, residue, and any impurities on the surface of the base material that would compromise the weld's effectiveness. It is essential to avoid any such contamination on a weld's surface, which could otherwise lead to a weakening of the weld's mechanical properties, requiring rework.

Laser treatment is also used for post-weld cleaning to increase the life expectancy and corrosion resistance of a welded joint. Post-weld cleaning is important for stainless steel as well. Welding can cause a "heat tint," a discolored, thickened top layer on the stainless steel around the weld bead within the heat affected zone that compromises corrosion resistance. Removing the heat tinted top layer is necessary to restore stainless steel's full corrosion resistance and aesthetic value.

A further benefit of the laser systems is that some of the most advanced units are designed to last for decades. For example, CleanTech laser systems can last for 50,000 to 100,000 hours. In addition, virtually no maintenance is needed after purchase and no consumables are required.

Given the devastating cost of corrosion to industry and the inherent limitations of typical control methods, lasers are becoming a best practice technique to combat it in facilities and in the field. Laser treatment effectively removes corrosion for many industrial applications, minimizes cleanup time and operator exposure to potential environmental health hazards, lasts for decades, and requires no consumables.

For more information, contact Laser Photonics at laserphotonics.com.

*Author: **Del Williams**, is a technical writer based in Torrance, California.*

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Handbook of Corrosion Engineering Modern Theory, Fundamentals and Practical Applications

Handbook of Corrosion Engineering: Modern Theory, Fundamentals and Practical Applications explores recent progress in metals corrosion and associated protection processes, spanning all corrosion-related characteristics utilized in natural and industrial environments, including monitoring and testing. The book combines the science and engineering of corrosion to assist readers in conducting exact corrosion evaluations in the design and plant management phases, including optimal protection methods. The book examines the basics of corrosion science, including the electrochemical mechanism, thermodynamic and kinetic aspects, different corrosion forms – such as uniform, localized, and stress corrosion phenomena – and protection systems adopted to combat corrosion, including inhibitors, coatings, and cathodic protection.

The 650-page volume focuses on industrial requirements, including codes, standards, regulations, and specifications; recommends materials for control and prevention of corrosion damage; offers industry-tested best practices, rationales, and case studies; covers materials, corrosion, corrosion inhibition, coating, heat treatment, test and inspection, and mechanical design and integrity; includes websites of interest and information about latest research; comprises exercises and practical examples to understand, predict, estimate and mitigate corrosion problems.

Featuring numerous pictures, figures, graphs, and schematic models to ensure a clear understanding of the science and engineering of corrosion, the book is ideal for chemical engineers and chemists in R&D and academia working on corrosion systems; students, scientists, college and university professors, research professionals, technology investors and developers, research enterprises, R&D and defense research laboratories, academic and research libraries in the fields of chemical engineering, chemistry, materials science and engineering, nanotechnology, energy, environment, colloid science, etc.; libraries in universities and industrial institutions, government and independent institutes, individual research groups and scientists working in the field of antimicrobial coatings systems

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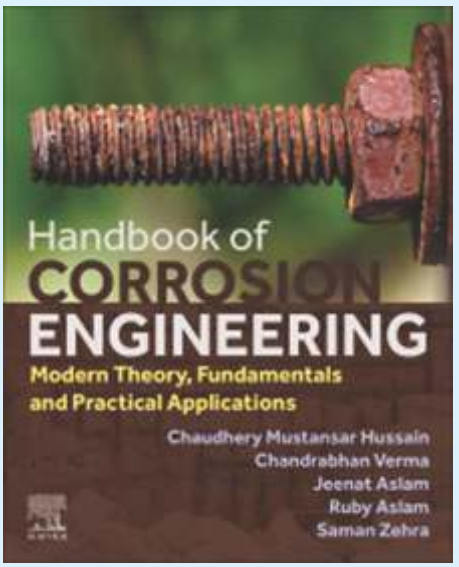

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Cathodic protection, like coatings, a must to protect assets

Cathodic Protection is an engineering service that is not very well understood in the industry yet, notes Rogelio De Las Casas, of DeLasCasas CP, LLC, who was in India recently in a chat with C&ACER

Graduated from the University of Havana, Cuba with a bachelor's degree in metal physics, Rogelio De Las Casas has firmly established himself in the world of Corrosion Engineering. With over thirty years of combined experience in cathodic protection, DC and AC mitigation, Rogelio is capable of providing consultancy services in all of the areas of cathodic protection, DC and AC interference science and engineering.

Becoming a NACE international member in 1997 and obtaining his NACE Senior Corrosion Technologist certification in 1999, Rogelio quickly became a Cathodic Protection Specialist in 2000. Currently, Rogelio is also a certified NACE CP instructor for CP-I, CP-II, CP-III, and CP-IV in both English and Spanish. Rogelio has been the Chairman of the CP Advance Section of the Short Corrosion Course at Purdue University-Lafayette, IN, between 2010 and 2022.

Rogelio's main field of interest is in Simulation of CP systems, Application of Potential Theory to CP and interference problems. His Use of Mathcad and development of simulation sheets for CP, DC and AC interference studies can be seen in his papers and multiple presentations on this field of applications. Rogelio has developed a set of equations that are the state of the art in simulation of cathodic protection systems. These equations have filled a gap between the old equations that were taken originally from the design of grounding systems and the need for more accurate presentations of the cathodic protection systems. The equations have been developed during the years to explain specific cases that were not accurately represented by the classic equations for resistance and potential calculations.

DeLasCasas CP, LLC (DLC2P). is a provider of advanced Cathodic Protection engineering services. DLC2P specializes in the design, simulation, testing, inspection and project management for the installation of Cathodic Protection systems as well as DC Interference Mitigation for underground and submerged metallic structures. These structures include but are not limited to: underground pipelines, underground and above ground storage tanks, sheet piles in seawater, etc. Further services also include AC mitigation design, inspection of installation and more.

Rogelio De Las Casas on a field inspection assignment.

Rogelio was in India recently as part of AMPP's training program. He spoke with C&ACER about his company and the latest developments in Cathodic Protection.

What are the challenges you face in the industry?

One of the main challenges is that we are a small business. In the United States, there is a lot of competition. So, to ensure that we keep our clients happy with us, we have to do a good job. I have been in the business since 1988, so that is more than 30 years. First, it was in Cuba, where I was born working for a company that specialized in oceanic cathodic protection. Then I moved to Venezuela because petroleum and oil is a big portion there. From there I moved to USA and worked with several companies until we opened our own business DeLasCasas CP, LLC (DLC2P). The main challenge is getting enough information from the clients to allow you to interpret the data. Then to troubleshoot the problem, to find out what solutions should be applied.

Rogelio De Las Casas, Principal Consultant/Engineering Operations Manager, DeLasCasas CP, LLC

What is the level of awareness about cathodic protection within the industry?

Cathodic protection is something very important for the gas and oil industry. We have to keep the assets protected from corrosion.

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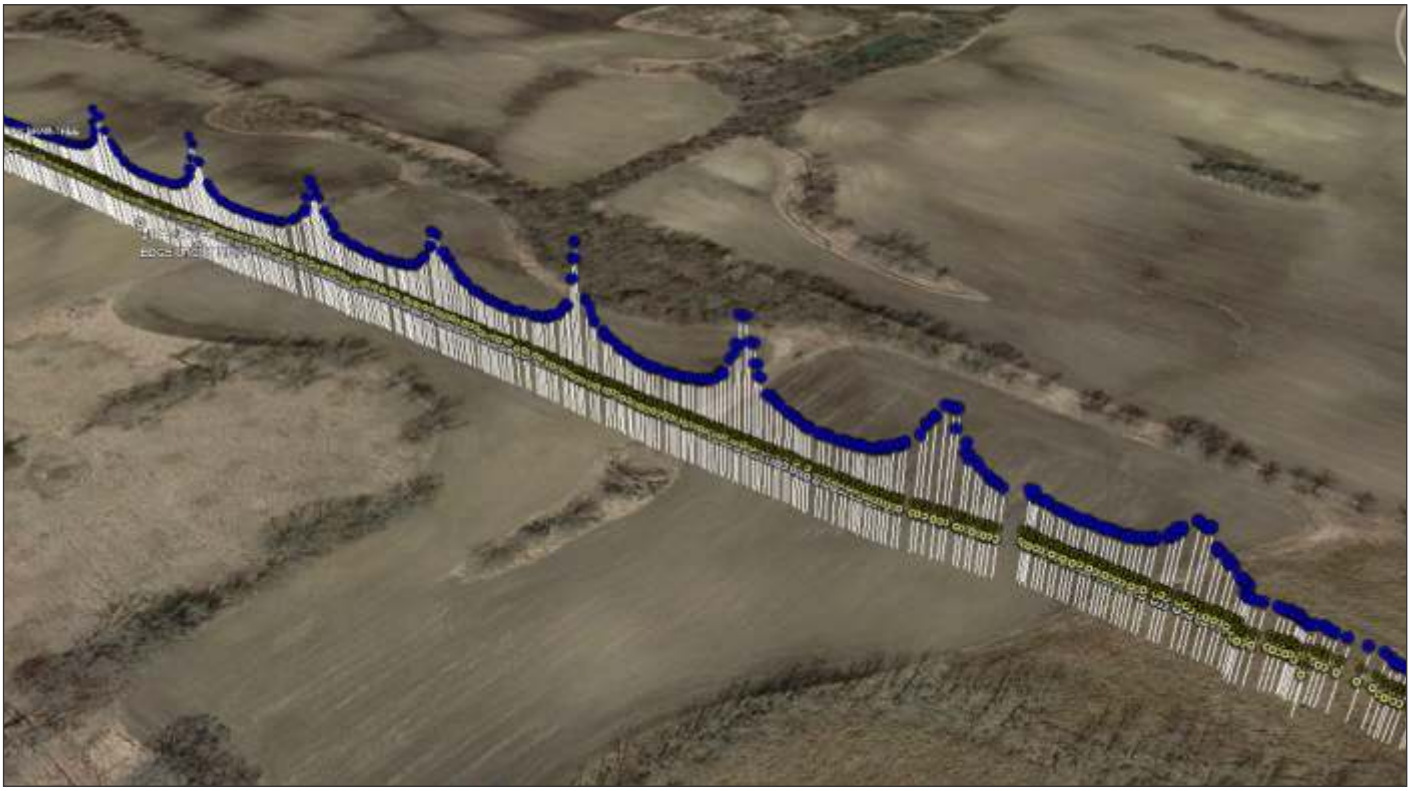

3D CIS plot of a CP survey inspection.

Cathodic Protection is an engineering service that is not very well understood in the industry yet. But the clients are getting more interested and learning about the processes involved in Cathodic Protection.

What can be done to overcome this?

Well, organize training programs, participate in conferences and prepare more people by disseminating the knowledge in this field.

Is cathodic protection being used to its full potential?

There are still some gaps. Sometimes, people don't want to spend money, and then it is too late. There's a leak, and you have to fix it. The cost is now more than it would have been to prevent the problem. Coating applications, along with cathodic protection is best used as a preventive tool.

In some cases, what we do is when the projects are being finalized we prepare conferences to present the services that were completed. So, the clients will know the advantage of using the services.

Are there any regulations and how strict are they?

In the United States, there are regulations. The government has put laws that oil and gas companies need to follow. Some of these laws implies the application of cathodic protection. So, the regulators have the obligation every year to check the information from the oil and gas companies. This keeps them doing the activities to keep the pipelines safe and intact. It's good for us because we say, “we are the doctors of the pipelines.” The other good thing for the industry is that regardless of the economic situation cathodic protection is a necessity. Like coatings, they have to be applied. Otherwise, the assets will be damaged. That's why in the United States, the regulators have done a good job pushing the companies both in good and bad times.

How is it in other parts of the world?

I am a CP Level 4 cathodic protection specialist. Earlier, there was no real compulsion to get to that level. Now the majority of oil companies in South America, for example, are asking contractors that they have to have a CP specialist in charge of the projects. This is good for us because there are not too many CP specialists in South America. So, they do the jobs and we approve if the job is done correctly or not or what needs to be changed to improve the quality of the project. In some instances, we visit the project and asses the cathodic protection application on site.

Here in India too, they are trying to promote the same services. AMPP is pushing the idea and the need to get engineers certified to improve the quality of services to oil, gas, and water companies. These are the three major industries.

Are there any improvements happening in the technology?

Yes, we now use the GPS, the Internet, cloud technology in a big way. There are lots of improvements in the instruments too. They get smaller and smaller and easier to use. The method of disseminating information with our clients has tremendously improved. There are new design tools for calculation, drawings and simulations. We also use Google maps so that we can collect the data from the field

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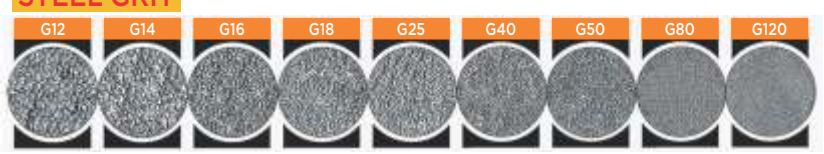

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and our clients can see it in real time like where there is a problem in a pipeline. When there were no Google maps, all this was difficult. We also use satellite information for monitoring the cathodic protection applications with remote monitoring units that are installed in rectifiers or test stations even in the middle of nowhere. This technology allows our clients to receive real-time data and how the equipment are working. Earlier, you had to go there and check yourself. Now you don't have to go all the time. But there are regulations that the company has the obligation every six to seven years being in the field anyway and collect the data.

Then, the use of solar and yes, also wind energy enables us to apply the power required to the system where power availability is poor. We can use that extensively even in the middle of nowhere, like in a jungle or the desert.

What are the mistakes that people make?

One of the mistakes is not interpreting the data correctly. Sometimes, the technicians that go to the field are not well prepared.

It is essential that we protect our assets and thereby the environment which is now a big concern on the global level.

What are the kind of services that you provide?

Either to create a new design or improve an existing design, we have the experience needed for the job. Basically what our company provides is cathodic protection engineering services like designing CP systems, simulation, and troubleshooting of existing CP systems in underground pipelines, transmission and distribution systems, underground tanks, bottom or above ground individual tanks or tank farms, underground metallic structures at refineries, pump stations, gathering systems, where pipeline distribution is non-uniform, and complex anode's spatial distribution is expected, gas and oil wells, offshore structures, assessment of CP design prepared by others to determine the CP system performance before its installation.

We also provide CP installation inspection when NACE certified personnel is required, client assistance in supervising and inspection of CIS-DCVG-ACVG-PCM surveys for underground transmission and distribution lines, annual CP surveys with field report conclusions and recommendations, DC interference studies, simulation, material specification, design, installation supervision and commissioning.

Other services include data analysis and providing conclusion and recommendation to clients, based on data acquired by others, for example, analysis of CIS, DCVG, ACVG field survey data, 3D CIS Survey Mapping using Google Earth, and also training of technicians on CP for CP courses preparation and attendance.

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Coatings industry trends towards a sustainable future

Sustainability entail a plethora of activities like energy and resource conservation, waste minimization, process efficiency enhancement, use of renewable materials

Years ago, green or sustainable coatings were deemed eco-friendly coatings that emit almost negligible or zero volatile organic compounds (VOCs) during the production and application processes. This definition has now been extended to include sustainability aspects.

There are three major elements that drive the coating industry towards sustainability: Health, Climate Change, and Circular Economy. These entail a plethora of activities like energy and resource conservation, waste minimization, process efficiency enhancement, use of renewable materials, etc.

Industries have come to understand the importance of sustainability and are now moving towards a sustainable future. The coating industry is also following the lead and innovating. Companies are now also considering the societal impacts of their activities that impact the entire value chain. Startups and Universities are stepping in and collaborating with companies to deliver exceptional products.

The global green coatings market is projected to garner substantial growth from 2023 to 2033. According to the research report published by Future Markets Insights (FMI), the global market is projected to cross a valuation of US$ 131.27 billion in 2023. It is likely to reach a valuation of US$ 213.83 billion by 2033. The market is anticipated to show a modest CAGR of 5% from 2023 to 2033. The increasing prioritization of sustainability by both businesses and consumers is predicted to bolster market expansion in the coming years.

In recent years, the emphasis on environmental regulations has risen globally. Governments across the world are aiming to reduce pollution and promote sustainable practices. Since green coatings align with these regulations, they are sought after as a way to reduce the environmental impact of coating applications. Several nations have implemented regulations and certifications such as Leadership in Energy and Environmental Design (LEED) to limit the use of VOCs and promote environmentally friendly coatings. Green coatings that meet these regulations and certifications can help companies and individuals comply with environmental standards and demonstrate their commitment to sustainability. The growing government regulations are predicted to contribute to market growth.

PHOTOS: 123RF

Governments across the world are aiming to reduce pollution and promote sustainable practices.

The growing innovations and advancements in technology are predicted to boost the market. The coating industry is constantly innovating and developing new technologies to create more sustainable and high-performance coatings. Advancements in research have led to the formulation of green coatings with improved characteristics such as enhanced adhesion, durability, and weather resistance. The innovations have expanded the range of applications where green coatings can be used. As a result, the expanding application range is likely to augment the demand for green coatings.

The increasing construction activities are anticipated to amplify the demand for green

coatings. As they contribute to better indoor air quality and healthier living and working environments. The automotive sector too has been witnessing a consistently growing product penetration and exponential growth in their products and innovations. The climate concerns and public awareness are pushing the existing OEMs as well as start-ups and small businesses to innovate and develop eco-friendlier coatings. The increase in demand could also be attributed to the company's willingness to replace the existing coatings with low-VOC emitting coatings, notes the FMI research report. The rising demand for waterborne and powder technology, especially in architectural and automotive applications is also expected to drive industry growth.

The recent World Coatings Council's inaugural "Sustainability in the Global Paint and Coatings Industry" report highlights the global industry's ongoing sustainability efforts and how these activities help to advance coatings science and manufacturing technologies. The report notes how essential paints and coatings remain as part of the overall manufacturing value chain, and the advantages manufacturers can provide to customers and suppliers.

By improving the durability of assets, the industry is supporting extended product lifecycles, circularity and reuse, while preserving both renewable and non-renewable sources for generations. Manufacturers must leverage this as a strategic advantage and prioritize the continued development of industry-leading sustainable solutions to meet customer needs.

"Value innovation can have a significant impact on sustainability for protective coatings," said Mr Sanjay Chowdhury, Vice President and Business Head, Berger Paints Ltd. "For example, new coatings that are more durable and require less maintenance can help reduce waste and emissions." He said, "Water-based coatings are a more sustainable alternative to solvent-based coatings. They emit fewer VOCs and are less harmful to the environment. Fluoropolymer coatings are used to provide chemical resistance and reduce friction on various industrial structures and components. Its high gloss retention and color retention properties help to extend the lifespan of metal structures and reduce the need for repairs."

Although zero-carbon fuels and technologies might not yet be ready for wide-scale adoption, shipowners can turn to paints and coatings to support their sustainability goals.

A growing feature in the coatings industry is to reduce energy usage in manufacturing or application processes. "Energy saving has become an extremely important issue in the coating industry. Force dry / baking of paint film, consume huge amounts of energy. One way of minimizing the energy consumption is to reduce the curing temperature or to make faster dry coating," said Mr Vimal Doshi, Technology Manager, Industrial Coatings Division, Axalta India. They were speaking at the 15th International Conference on Surface Protective Coatings and Paint Expo, in Mumbai recently.

There has been considerable interest in the development of powder coating resins with lower stoving temperatures for some time, largely driven by the desire to use the 100% solids coatings on MDF, wood and other temperature-sensitive substrates. However, this trend towards using less energy in coatings processes, whether in application processes or manufacturing, is likely to strengthen in the coming years.

Probably the most important driver for the development of radiation curing systems was the speed of cure and the increased productivity, but the emergence of LED lamps has provided an opportunity to move away from mercury arc lamps, significantly reduce energy usage and increase lamp lifetimes. However, the spectral output of LED lamps in the near-UV/visible region and oxygen inhibition issues have led to developments in photoinitiator systems, monomers and oligomers.

Another example of product development aimed at reducing energy usage is the development of infrared (IR)-reflective pigments. One of the more important uses of these pigments is in roof coatings to reduce building temperatures by reflecting more of the sun's radiation. There have been a number of reports over the last few years examining and quantifying the value of applying white and light-colored roof coatings on flat roofs and the roofs of metal warehouse/logistics centers in reducing the interior temperatures of those buildings and the energy used by air-conditioning units.

The development of non-white IR-reflective pigments including greens, browns and blacks offers a wider use of 'cool' coatings for, for example, roofing tiles. The use of cool coatings can provide a cost-effective means of reducing energy use in buildings and heat island effects in major cities, especially in hotter climates.

"Global warming is not a myth in fact it's a glaring threat," said Mr P. P. Joshi, General Manager – Technical & Operations, Thermogreen Cool Coat Pvt Ltd, Mumbai. "This can be seen in the climate change leading to

natural disasters happening globally like massive floods, hurricanes, wild fires, heat waves, heavy snowstorm, melting of glaciers, etc., to name a few. The major reason for global warming is the increase in greenhouse gases and primarily CO_2 gas owing to use of fossil fuels. While cleaner alternatives to reduce carbon footprint like solar, wind, tidal, hydro, etc., is constantly sourced globally, one of the invisible large consumer of energy and generator of carbon footprints are building infrastructures. The air-conditioners used for cooling the building interior consumes large amount of energy and generates enormous amount of carbon footprint. Moreover, these buildings absorb a large amount of solar heat during the day and radiate it as evening progresses creating a 'heat island' effect which adds to the discomfort of the masses. The simplest way to mitigagate this is by using energy saving coating like the Thermocool SHR Coating, an innovative and patented product developed by IIT Bombay which helps mitigate these adverse effects of solar heat, thereby bringing comfort to the masses from solar heat, reducing energy consumed by HVAC i.e. help reducing carbon footprint plus prevent cracking and leaking of structure owing to thermal expansion and contraction. Thermacool is a DIY coating system which has dedicated products for concrete and metal substrates. It can be applied on terraces, roofs, walls, hangers, warehouses, factory sheds, trains, buses, water tanks, porta cabins, etc."

Like many industries, automotive original equipment manufacturers (OEMs) are looking across their entire supply chain for opportunities to reduce their environmental impact. While it's clear that electric vehicles (EVs) are key enablers of the transition to a low-carbon economy, suppliers must be prepared to support this transition with alternative low-carbon products and processes.

PPG launches low-temperature cure electrocoats for automotive manufacturers

Historically, the paint shop has been the most energy intensive area of automotive OEM facilities, presenting a strong opportunity for paints and coatings manufacturers to help their customers decarbonize. One of PPG's most recent innovations is the PPG ENVIRO-PRIME EPIC 200R a suite of electrocoat (e-coat) products that cure at lower temperatures than competing technologies. The products provide sustainability benefits for customers, including lower energy use and reduced CO_2 emissions at manufacturing facilities.

"This is a game-changing technology," said Garry Grant, PPG global product manager, substrate protection products, Automotive Coatings. "Conventional e-coats typically require higher oven temperatures to cure over thicker substrates and complex assemblies, resulting in uneven appearance and variations in color. The PPG ENVIRO-PRIME EPIC 200R platform ensures well-cured films at lower baking temperatures, providing a more sustainable solution without sacrificing manufacturing throughput or coating performance."

PHOTO: PPG

PPG ENVIRO-PRIME® EPIC 200R electrocoat products cure at lower temperatures than competing technologies, providing sustainability benefits for customers including lower energy use and reduced CO_2 emissions.

As part of its growth strategy, PPG is focusing on partnering with customers to provide industry-leading innovations and digital solutions that provide productivity and sustainability benefits. In 2022, 39% of PPG's sales were from sustainably advantaged products – the company aims to increase that to 50% of total sales by 2030 under its new environmental, social and governance (ESG) targets.

PPG is a pioneer in e-coat, which has been used in automotive and industrial applications for nearly 60 years and is a key innovation leading to significantly reducing auto body corrosion and extending vehicle lifespan. It is a water-based technology, providing outstanding substrate protection for cars, appliances and airplanes and is applied at over 95% efficiency, minimizing material waste.

In addition, historically, the maritime shipping sector has faced challenges on its journey to decarbonization. Although zero-carbon fuels and technologies might not yet be ready for wide-scale adoption, shipowners can turn to paints and coatings to support their sustainability goals.

One example that helps support the maritime industry's transition is PPG SIGMAGLIDE 2390 marine coating, which helps shipowners lower energy consumption and carbon emissions and meet demands for higher performance without adverse impact on the marine environment. Based on third-party evidence following ISO 19030 and International Towing Tank Conference standards, this coating allows vessels to maintain a clean hull and reduce drag, achieving power savings of up to 20%, a speed loss performance of less than 1%, and up to 35% reduction in CO_2 emissions in comparison with traditional antifouling coating.

Hurtigruten Norway is now receiving valuable assistance to develop sustainable Hurtigruten ships without emissions. Together with 13

partners, they have been granted NOK 67 million in support for the "Sea Zero" project.

The support comes from Green Platform, a scheme that will contribute to research and innovation-driven green transformation and lower greenhouse gas emissions, and is managed by the Research Council, Innovation Norway and Siva. This support means that Hurtigruten Norway's plans to sail emission-free on the Norwegian coast take a big step forward, and that we are on track to be able to sail our first zero-emission ship by 2030, says Hedda Felin, CEO of Hurtigruten Norway.

Hurtigruten Norway started the "Sea Zero" project in spring 2022 to create the first emission-free Hurtigruten ship by 2030 together with SINTEF and a number of Norwegian actors. With allocated funds from Green Platform, the partners will already start the research and development part of the project at the beginning of 2023. It costs to go ahead. It is therefore gratifying that the Norwegian authorities are providing funding so that the Norwegian maritime industry can develop the best zero-emissions technology. Our goal is that the work we and our partners do with emission-free express route ships will contribute to making Norway a leader in green shipping, and thus give Norway new income, says Felin.

The fact that emission-free ships are to be developed for traditional Hurtigruten Norway is in itself very positive for the climate, but will also have major ripple effects for the maritime supplier industry throughout Norway. New green technology development adds increased expertise and export potential to the Norwegian maritime supplier industry, not least for the partners in the project. When a major player such as Hurtigruten Norway invests in green solutions, it also provides opportunities to develop green infrastructure along the coast, for example charging points, which can provide a large reduction in emissions for many players, says Trond Johnsen, marketing manager at SINTEF Ocean.

Circouleur is a French startup specializing in paint recycling. It thus valorizes the bottoms of the pots by avoiding incineration in order to recreate paint which can be used by individuals and professionals. A major market since 28 million liters of water-based paints are sent to incineration or landfill each year in France alone, even though these products are perfectly recyclable. However, until now, no recycling sector has addressed this subject. Too bad for the environment since, according to figures from Ademe (The French Agency for Ecological Transition), the incineration of these leftover paint causes the emission of 220,000 tons of CO_2 into the atmosphere every year.

The startup is the first French player to offer recycled paint and to structure a sector to industrialize paint recycling. A project launched in 2017 in Gironde, in Blanquefort, by Maïlys Grau, a trained chemist who was notably inspired by a process that works very well in Canada. “While doing painting work at home, I wondered what happened to the opened pots. At the same time, I was looking to start a business with a positive impact on the environment and that was meaningful to me. I then did some research and discovered that our acrylic paints are incinerated even though Quebecers have been recycling them for over 20 years. I then decided to embark on the adventure and set up the recycling sector in France,” explains the entrepreneur, joined in her project by her partner Marianne Rittaud.

Twenty eight million liters of water-based paints are sent to incineration or landfill each year in France alone.

For more than five years, the two partners have worked to develop a range of high-end paint cans that incorporate at least 70% recycled paint. A product that has a double advantage for the environment: fewer CO_2 emissions by avoiding incineration and fewer volatile organic compounds, since the solvents contained in the paint since its manufacture have evaporated during the first use. This ensures that indoor air quality is not harmed.

Circouleur therefore revalues paint that was intended to be destroyed in order to put it back into circulation. To date, it offers a range of more than 14 colors which is gradually distributed in France via specialized brands (Mr Bricolage, Les Briconautes, L'entreprises du DIY, etc.). And alongside its environmental mission, the young company also has a social vocation, with priority given to solidarity-based jobs. Thus, sorting paints and labeling pots are tasks carried out in part by people in professional integration or with disabilities.

On the supply side, the startup has structured a network of partner recycling centers, and established a strategic partnership with SARP Industries, a subsidiary of Veolia. This partnership allows the young company to secure access to a paint deposit and thus increase its production to move towards a production objective of 200 tonnes of recycled paint each year!

Pre-adsorbed Selektope®
Creation of a new carrier system for Selektope® via pre-adsorption on Zinc Oxide for enhanced antifouling performance

Abstract

Over the past five years, I-Tech's (selektope.com) team of R&D scientists have discovered new ways in which the first-of-its kind biocide, Selektope® can be introduced to marine antifouling coatings with little or no effect on formulation chemistry and in combination with other biocides.

Selektope is the brand name of the active agent medetomidine patented and registered for use in marine coatings by I-Tech AB. It has a unique mode of action amongst other biocides used in marine antifouling coatings because it repels the target organism rather than killing them. This is achieved by receptor stimulation whereby medetomidine interacts with the octopamine receptor of the barnacle larva causing the rapid kicking of the larva's swimming legs. This technology induces the effect that the barnacle has no option but to swim away from the coated surface.

Currently, the most common way to introduce Selektope into a self-polishing copolymer (SPC) coating matrix and to prevent its premature depletion is via Selektope interacting with a carrier (e.g., pigment particle) in the paint mixture. The introduction of Selektope, which is supplied as a powder, into a paint during the manufacturing processes is preferably done by first dissolving it in a solvent and then adding it into the wet paint matrix. By adding the active substance early in the paint making process, the chances of Selektope adsorbing onto the surface of other paint components (e.g., inorganic metal oxide pigments) are maximized. The Selektope attaches to the pigment surface through molecular interactions, rather than being free in the wet paint.

Although the controlled release of Selektope in SPC coatings has proved successful using the introduction method described above with multiple products commercialized to-date, recent I-Tech R&D efforts have focussed on obtaining proof of concept that pre-adsorbing Selektope on the carrier compound zinc oxide (ZnO) improves coating stability, reduces the risk of viscosity increase and improves biocidal leaching for sustained antifouling performance. By “pre-adsorbed” we mean adsorbing Selektope on the surface of a pigment from Selektope solution, followed by separation evaporation of the solvent to obtain a powder additive of Selektope adsorbed on the surface of the pigment. This pre-adsorption process is completely external from the actual paint manufacturing process. Tests conducted to-date show strong results and I-Tech is continuing work in this research field.

Tech R&D scientists have investigated a new concept of easy-to-use pre-adsorbed Selektope/pigment powder additive.

An additional proof of concept was obtained for the addition of Selektope pre-adsorbed on ZnO to silicone-based foul release coatings. If Selektope is not properly incorporated into a foul release coating matrix it will leach to the surface of the coating too fast. Therefore, this new method of introducing Selektope pre-adsorbed to ZnO could open a route for the use of the biocide in these types of coating systems. Another major benefit is that the addition of Selektope, pre-adsorbed on pigment particles, does not require fundamental reformulation. By contrast, it is even possible to add it into ready-made paint. Positive test results have been obtained to-date and further testing is underway in this research field.

What is Selektope®?

Selektope (common name: medetomidine) is an active agent developed, patented and registered by I-Tech AB for use in antifouling coatings. It is a highly selective technology that induces effect on the target organism at very low-small concentrations (nano molar).

When a barnacle larva comes into contact with Selektope, they become hyperactive, and their swimming legs perform around 100 kicks per minute. This is due to their octopamine receptor being stimulated by the medetomidine. The effect is reversible, and the larvae quickly return to their normal state when not exposed to Selektope. In this way, the larvae cannot attach to a surface painted with Selektope and, at the same time, there is no fatal impact. Selektope can coexist with all existing, approved biocides and other ingredients in a paint matrix. However, how and when it is added during the production process is key

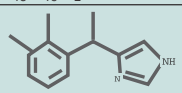
CAS-No.	86347-14-0
EINECS-No	Not listed
IUPAC Name	4-[1-(2,3-dimethylphenyl)ethyl]-1H-imidazole
Other common name	Medetomidine
Molecular formula	$C_{13}H_{16}N_2$
Structural formula	
Molecular weight (g/mol)	200,28 g/mol

Figure 1: Selektope: molecular and structural formula.

☐ Reduced exposure risk of the biocide during the paint production process.

☐ No redevelopment or change to formulation chemistry is required.

☐ Controlled release of Selektope from the coating.

to controlling its release rate from an antifouling paint.

This active agent is preferably dissolved in a solvent before being added into the paint matrix. The conventional formulation method is to add the Selektope solution together with fresh metal oxide pigment, such that the Selektope molecules are able to adsorb on the pigment surfaces in-situ during paint production. Cuprous oxide (Cu^2O), zinc oxide (ZnO) and iron oxide (Fe^2O^3) are commonly used. Selektope adsorbed on ZnO in-situ during the paint production process is the most common method.

The challenge: Reinforcing paint stability

To-date, Selektope has been introduced as a co-biocide into a range of self-polishing co-polymer (SPC) systems. The first antifouling coating systems commercially introduced to the ocean-going vessel market that made use of Selektope were silyl acrylate SPC coatings, with one premium coating developed as a copper-free solution.

Selektope can also be used in zinc acrylate, copper acrylate and nano acrylate SPC coatings. Silyl acrylate SPC coatings are generally sensitive, and gelation and instability problems can arise if the paint products are stored for too long. In fact, most silyl acrylate systems have a shelf life of around one year only. This issue being that the viscosity of the paint products increases over time, a process known as gelation. Gelation in antifouling coatings creates issues during the application process since paint with a higher viscosity can clog up the tip of the spraying nozzle, resulting in the paint not being sprayed well, or even at all. If the paint is thinned to make it spray-able, it may no longer have the right properties. Gelation may also influence the general performance of the coating, e.g., its polishing and antifouling properties.

The presence of free Selektope molecules may influence the shelf-life of silyl acrylate-based paint. In the presence of trace amounts of water, Selektope catalyses hydrolysis of the silyl ester bonds in the silyl acrylate polymer. Hydrolysis causes the formation of carboxylates on the polymer chain which upon coordination to metals in the paint formulation cause gelation. It is, therefore, important to anchor Selektope molecules with other paint components, preferably through adsorption on metal oxide pigments, and thereby minimize the amount of free Selektope molecules in the wet paint and slow the rate of gelation. To prevent the hydrolysis, and subsequent gelation, it is also important to remove traces of water in the silyl acrylate paint. Selektope is, therefore preferably combined with a water scavenger additive in the formulation.

Although the paint manufacturer that first commercialized Selektope-containing silyl acrylate SPC coatings reports that they have encountered no issues to date, this is an area of R&D focus for I-Tech since minimizing the effect of Selektope on silyl acrylate instability will further future-proof the use of the biocide in advanced marine coatings.

Concept and strategy

Although the conventional method of adsorbing Selektope on pigment in-situ during the paint production process has been proven to extend the shelf life of silyl acrylate-based paints, to obtain controlled release and improved in-can stability, I-Tech R&D scientists have investigated a new concept of easy-to-use pre-adsorbed Selektope/pigment powder additive. This would offer the benefits of:

☐ Improved dispersion of the biocide.

☐ Reduced risk of high viscosity.

By adsorbing Selektope on a carrier particle, such as ZnO, the amount of free Selektope molecules in the wet paint formulation can be limited. If there is no free Selektope, incompatibility is reduced. When Selektope pre-adsorbed on a metal oxide pigment is used together with a water scavenger, the rate of gelation is significantly lower since there will be fewer free Selektope molecules and water molecules available to promote the hydrolysis of the silyl acrylate polymer, which consequently slows down the gelation process.

A secondary challenge that the I-Tech R&D team is continuously working on is to enhance the processes for introducing Selektope during the paint production process. The production of marine antifouling paints is done on industrial scale and so, improving the ease of use and reducing worker exposure to the biocide is of immense importance. The advantage of this concept is that supply of adsorbed Selektope on ZnO promotes and easier use of the biocide during the paint production process, this is because it is easier to handle (it is heavier and airborne contamination risk is reduced) and the risk of exposure is lowered. This also facilitates fast and easier production since time is saved by the

pre-dissolving of Selektope in solvent having already been completed before the material is received at the paint production facility.

The omission of the dissolving Selektope in solvent stage also reduces dermal absorption risk. Although currently inhalation and dermal penetration risks are addressed by the sealed, dissolvable packaging in which Selektope powder is supplied that is added directly into the paint batch during the production process.

To further this concept, small amounts of metal oxide pigments with Selektope pre-adsorbed can be added to silicones, epoxy silicones, etc. This opens up a route for Selektope to be used in silicone-based foul release coatings. This may require some reformulation to existing formulation concepts, but not a fundamental reformulation.

The approach

I-Tech R&D scientists used Selektope/ ZnO material in powder form produced by the adsorption method. The Selektope was first mixed with solvent and ZnO powder. The suspension of ZnO and Selektope solution was stirred for period long enough to allow for the Selektope molecules to adsorb on the ZnO surface followed by evaporation of the solvent, yielding a dry Selektope/ZnO powder.

Test paint formulations containing the produced Selektope/ZnO powder were created to mimic commercially available antifouling coatings. Viscosity analysis was conducted for the silyl acrylate SPC coatings in order to assess the gelation and shelf-life. Water scavenger (TEOS, tetraethyl orthosilicate) was added to the SPC formulations to remove traces of water, hence further inhibit the gelation process.

The antifouling properties of the produced Selektope/ZnO powder were tested in silicone-based foul release coatings. This was done by addition of the powder material to ready-made commercially available silicone-based foul release coatings. The painted test panels were submerged in the sea on the Swedish west coast and the fouling on the coating surface was assessed regularly.

Results: Viscosity analysis of silyl acrylate SPC coatings

It is known that in-situ adsorption, i.e., adsorption as one step in the paint production process, of Selektope on the surfaces of commonly used pigments slows down the gelation of silyl acrylate-based paint. However, the research conducted by I-Tech R&D scientists investigated ex-situ adsorption of Selektope onto the surface of ZnO, i.e., the use of Selektope/ZnO additive in the form of a dry powder, produced in a process completely separated from paint production itself.

The results in Figure 2 clearly show that when Selektope is pre-adsorbed on ZnO as a carrier prior to being introduced to a paint matrix, i.e., ex-situ adsorption, the process of gelation is slowed, and the in-can stability of the silyl acrylate paint is improved.

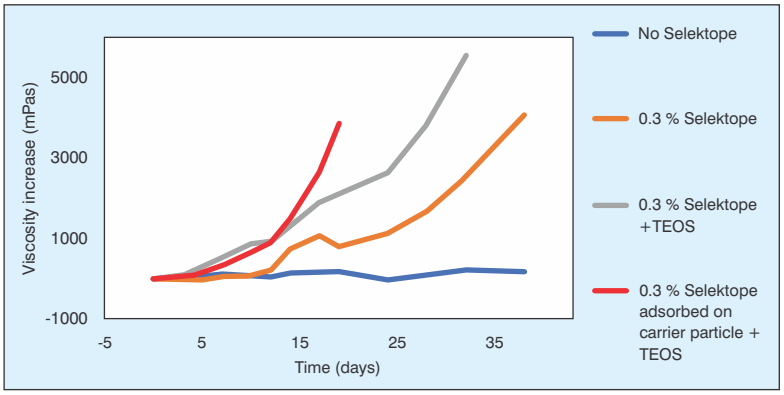


Figure 2: Viscosity increase (mPas) over time (days) for paint formulations containing no Selektope (blue), 0.3 wt.% Selektope added as solution (orange), 0.3 wt.% Selektope added as solution and TEOS (tetraethyl orthosilicate) (grey) and 0.3 wt.% Selektope adsorbed on carrier particle and TEOS (yellow).

The data in Figure 2 also show that it is particularly efficient to inhibit the gelation by combining pre-adsorbed Selektope/ZnO together with water scavenger.

Gelation is highly dependent on Selektope concentration. The paint samples tested in Figure 2 were prepared with higher Selektope concentration (0.3 wt.%) in order to accelerate the gelation process. In order to get a sufficient barnacle protection, usually a lower Selektope concentration of around 0.1 wt.% is sufficient for optimal antifouling effect. When testing with lower Selektope concentrations, gelation occurs, but at much lower rates.

Static panel testing of foul release coatings with Selektope

Selektope adsorbed on ZnO was added to a commercial silicone-based foul release coating. The Selektope content in the Selektope/ZnO was 10 wt. % and the total Selektope content in the wet paint was 0.1 wt. %. The Selektope/ZnO powder was added to ready-made paint containing no other biocides.

Two comparative reference samples were made. The first reference did not contain Selektope, hence containing no biocides at all. The second reference contained 0.1 wt.% Selektope added as a solution (Selektope dissolved in 1-methoxy-2-propanol). The Selektope solution was added to ready-made paint containing no other biocides.

The foul release coating topcoats were applied by brush in two layers on PMMA panels pre-coated with primer and tiecoat. The panels were divided into three sections where the upper sections were left untreated (undamaged), the middle sections were cut with a knife in the shape of a cross and the surface of the bottom sections were roughened with a sandpaper.

The images in Figure 3 show that whereas the undamaged foul release coating generally are efficient in preventing fouling, damaged foul release coating surfaces are easily subjected to fouling. The

Figure 3. Panels with foul release topcoat after 419 days submersion in the sea outside of Tjärnö (west coast of Sweden). The panels are divided in three sections where the top sections were left undamaged, the middle sections have a cross cut with knife and the surface of bottom sections were roughened with sandpaper. The topcoats contain the following additive, from left to right a) no additive, b) 0.1 weight% Selektope added as solution and c) 0.1 weight % Selektope added as a powder additive consisting of 10 weight % Selektope adsorbed on the surface of ZnO.

roughened surfaces of the reference samples in Figure 3a and 3b were particularly densely populated with barnacles primarily, but also other fouling species. For the same panels there were also barnacles settled in the cross-cut in the middle sections of the panels.

By contrast the sample containing Selektope/ZnO only showed a few barnacles on the roughened surface and no barnacles in the cross-cut. Hence, post addition of Selektope/ZnO powder additive to ready-made foul release coatings inhibits the barnacle settling on damaged surfaces significantly compared to the reference samples without Selektope or with Selektope post added as a solution.

The results clearly show that damaged foul release coating surfaces need additional biocidal protection against fouling. It is also clear that the post addition of Selektope solution to ready-made paint entails a risk of premature depletion of Selektope from the coating, due to lack of available adsorption sites on the surfaces of other paint components for Selektope. This shows the importance of anchoring the Selektope to other paint components in order to control the leaching rate of the Selektope. One way to do this is to adsorb the Selektope on the surface of a pigment, for instance ZnO as described in this paper.

Conclusion

Selektope/ZnO powder provides a new tool for the incorporation of Selektope into antifouling paints without the need for reformulation. The adsorption of Selektope onto a pigment carrier facilitates a more robust paint production and also mitigates the risk of shorter shelf life for silyl acrylates. Furthermore, it is an efficient tool to for adding Selektope in fouling release systems providing controlled release of Selektope over time. Test results confirm that Selektope adsorbed on ZnO significantly improves the issue of increasing viscosity (gelation) in silyl acrylate SPC coatings. Also, that the addition of a water scavenger mitigates the gelation issue even further. However, although the viscosity increase is lower when we adsorbed Selektope on ZnO, compared to the presence of free Selektope in the paint matrix, it doesn't completely prevent the increase of viscosity.

Further work is needed to use the full potential and convert the promising results to a commercial product. The next steps for I-Tech R&D scientists are to increase the knowledge base around this work conducted to date. Work to refine the process of adsorbing Selektope on zinc oxide, through the identification of the best solvent and best zinc oxide material combinations that allow for maximum Selektope adsorption will also be undertaken. This will also include the optimization of the ratio of Selektope and ZnO. Quantification of biocode release rates and upscaling will also be a focus of future work. I-Tech R&D scientists will also evaluate other non-soluble pigments such as ZnO and carbon black to study their performance.

Further study into the introduction of Selektope to non-polishing, foul release antifouling coatings via adsorption to ZnO pigment will be conducted. Following on from achieving proof of concept for both the adsorption of Selektope to zinc oxide to reduce the issue of increased viscosity in silyl acrylate coatings and also introducing Selektope to foul release coatings using this method, further tests will be completed to study the release rate of Selektope from SPC and foul release coatings containing Selektope/ZnO particles.

Courtesy: I-Tech AB

Now is a great time to automate your finishing process

Automation is not limited to just robots; it also includes simple machines and reciprocator spray technology writes Hope Dollarhide, Project Engineer, Automotive Component and Industrial Paint, FANUC America

Quick. Quality. Inexpensive. You can have two, but you can't have all three. We've all heard the phrase, but what does it mean when talking about automation – and more specifically about automation in the finishing industry? It means that the quality and success of a paint automation project is going to depend on what company you select as your automation partner, their ability to audit your process and make recommendations that will suit your business needs. Easy or quick does not necessarily mean quality and quality does not necessarily mean it was quick and easy.

Since 2020 it has been a rollercoaster with the pandemic, challenges in the economy, a massive labor shortage and supply chain chaos which has resulted in a huge increase in the demand for automation in virtually every industry. Let's talk about the job market. Currently there are more jobs than people, which means workers have more freedom with their job selection. This coupled with the large number of people leaving the workforce has created a nation-wide labor shortage causing companies to struggle to meet production goals. The finishing industry in particular lacks skilled manual sprayers to keep up with demand since workers are retiring at a record pace. The industry is both fortunate and tormented, on one hand blessed with the increased activity and demand for products in the market but afflicted by not having enough workers to handle the increased business. Because the issue is now, not in a few years, companies want a solution today. How do we solve the shortage of manual sprayers? What will you do if all your manual sprayers retire? Why can't we find young workers who want to be manual sprayers? These are real dilemmas for painters and coaters. They need immediate solutions before labor shortages impact their ability to remain viable and competitive.

Automation advancements have further simplified the process and allow customers with high-mix, low-volume parts to enjoy the benefits that robotics can offer.

Take a closer look at what automation can do

A viable solution could be to invest in automation. Automation is not limited to just robots; it also includes simple machines and reciprocator spray technology. A lot of paint and coating automation lines include reciprocator systems and/or paint robots. A reciprocator machine can be a great investment for manufacturers who have high-mix parts with simple geometry that need to be painted. These types of manufacturers are okay with broad spectrum paint applications and are happy to make a large investment in reciprocator technology.

When it comes to finishing robots, traditionally low-mix, high-volume applications have been the bread and butter of the industry. For example, a plant that paints 1,000 of the same tractors or trucks all day long is a great application, primarily due to a robot's repeatability. Today, however, robot technology has grown and expanded with new programming techniques. These advancements have further simplified the process and allow customers with high-mix, low-volume parts to enjoy the benefits that robotics can offer.

PHOTOS: FANUC AMERICA

Launching automation into a paint or powder coating facility can increase part throughput and quality of the finish.

Launching automation into a paint or powder coating facility can provide a multitude of improvements, such as:

- ☐ Increase part throughput and quality of the finish.
- ☐ Decrease the amount of material usage for painting and coating.
- ☐ Address the labor shortage challenges.
- ☐ Enhance repeatability by finishing parts the same way every time.

The largest hesitation of manufacturers with little to no experience with automation is the cost associated with installation. However, by selecting to work with an experienced and knowledgeable automation supplier who can provide a detailed ROI, those doubts are easily resolved. In fact, many plants have been able to achieve a quick ROI based on paint and material savings alone. Robots are also able to work full time 24 hours, 7 days a

week, running the same programs over and over with no issues or fatigue. This not only reduces the need for manual labor, but significantly enhances quality.

A knowledgeable system integrator is essential

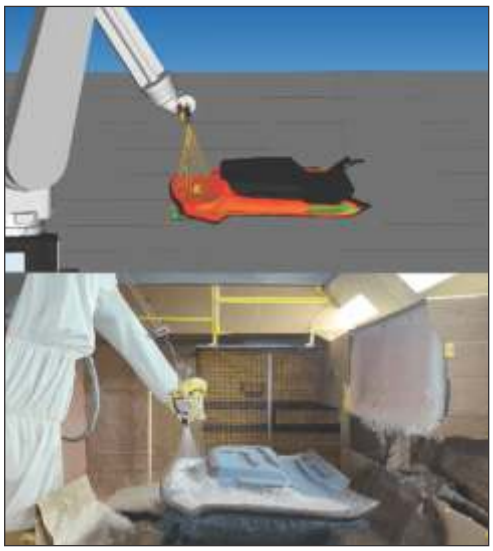
The key is to select a system integrator who specialize in finishing applications and has extensive knowledge about robots. There are many companies out there that specialize in providing automation equipment but finding one that supports a robot in their lab for demonstrating paint and powder coating applications is worth a second look. FANUC America has established relationships with a wide range of very capable robotic system integrators, paint suppliers and application equipment companies who are ready to assist.

Latest automation technologies helping painters and coaters

Once new users realize that it's possible to automate their existing paint booth, they need guidance regarding robot programming and operation. Some say there is not enough information available about what robots can do to improve painting and coating facilities. Or they believe that it would only complicate their process. It's so important to connect with a knowledgeable paint automation expert to provide accurate information and guidance. For example, robotic programming may appear intimidating or daunting, especially to those who have never tried it. After meeting with a company like FANUC or one of its Authorized System Integrators (ASI), painters and coaters will learn that today's user interface is simple and there are many assistance and easy-teach options available. Once employees are properly trained, a decent painter can become an even better paint robot programmer. Making the switch to automation offers your current and future employees a better environment, increased opportunities for workforce upskilling and higher wages.

Easy-teach tools

There are several easy-teach tools that assist in robotic programming. Easy-teach tools consist of several techniques and technologies that can minimize programming time. Two of those tools are offline 3D simulation programming and Scan-to-Path artificial intelligence.



Offline 3D simulation is PC-based and allows for manufacturers to program the robots in an offline setting.

Offline 3D simulation is PC-based and allows for manufacturers to program the robots in an offline setting. This means that the line does not need to be down to program. The controls and operation of the robots on the PC mirror the operations of the robot in the real world. Offline programming allows users to put CAD files in the software, and instantly calculate a paint path. From there, users can fine-tune the process and then adjust after using film build simulations to check the result. This tool is fantastic as it allows the user to adjust the program to their wants while not causing downtime.

Once employees are properly trained, a decent painter can become an even better paint robot programmer.

Scan-to-path is different from offline 3D simulation programming because it is completely based on artificial intelligence (AI). The system uses cameras and scanners to scan parts; either on a moving line or as a batch or stop station. The AI is then able to take that scan, build a 3D model, smooth it out, and generate a paint program. The robot can take this program and play it back in real time. This eliminates the need for manual programming. This is an excellent application for manufacturers who need instant and quick paths for high-mix parts.

There are other options for quick programming including lead-through-teach or hand guided programming. Lead-through-teaching is attractive because the best manual sprayer can grab the robot and guide it along the path that they think is best. This is appealing to painters and coaters that are first-time automation users because they see that the operation of the robot is much easier than expected. However, today's programming options – either offline in PC-based simulations, or navigating the robot's teach pendant are simple and intuitive and widely accepted by workers who are comfortable using teach pendants and PCs.

Are you considering automation?

Given the multitude of challenges that companies face today, including an unprecedented labor shortage, it's no doubt that many people are looking for a quick and easy solution that will increase quality and not break the bank.

Whether you've had experience with automation or have yet to use your first robot, it's a great time to automate your finishing process. Then you can answer the questions: Are we ready to automate? Do we need it? Are we prepared to reap the benefits?

After 40+ years, FANUC's commitment to paint innovation continues as we produce the highest quality products with one common goal: helping our customers all over the world achieve their production goals.

Feature courtesy: FANUC America

Manufacturers perceive significant coatings market growth in the BRIC countries, especially China and India: Future Market Insights Inc.

The BRIC performance coatings market which is expected to have generated US$ 95.9 billion in revenue in 2022, is anticipated to grow at a CAGR of 5.3% to reach US$ 8.66 billion by 2032, notes a report by Future Market Insights Inc.

Manufacturers perceive the significant population growth in the BRIC countries, especially China and India, as a huge opportunity to expand their businesses. Performance coatings like polyurethane and acrylic are now produced by manufacturers and deployed on automotive components, including wheel assembly washers, brake clips, and gas filler tubes.

The manufacturers make the performance coatings in such a way that they can be coated on furniture items to increase durability and applied to buildings for anti-corrosion in the construction industry. There will be a greater need for performance coatings in these industries due to their quick expansion, which will help the performance coating market thrive.

China's performance coatings market has the most significant potential for growth among the BRIC nations. For instance, according to the 2021 report on global vehicle production from the European Automobile Manufacturers Association, China produced 32% of the 74 million automobiles produced globally, while Japan and Korea contributed 16%.

Furthermore, according to the State Council of the People's Republic of China, in July 2021, China authorized plans for constructing inexpensive rental housing. Furthermore, according to the National Bureau of Statistics, China exported furniture and furniture parts worth US$63.9 billion in 2020, a 12.2% rise.

Indian performance coating industry is anticipated to see significant investments from new entrants in addition to capacity expansions and Greenfield projects by current paints and coating companies like Asian Paints and Berger Paints.

On the other side, the Indian government is implementing several initiatives, particularly programs like AMRUT and housing for all, which are projected to increase demand for interior paints, particularly those in the medium and low price range. Hence, by utilizing this opportunity, manufacturers are forming alliances with Government agencies to grow their businesses and increase income.

As the airline sector experiences tremendous expansion, industry players are developing performance coatings that are specifically designed for aircraft to defend against corrosion caused by adverse environmental elements and climatic conditions.

PHOTOS: 123RF

The Indian paint and coating industry is reporting healthy growth with government focus on domestic manufacturing and country's emergence as a manufacturing hub.

The demand for new commercial aircraft has surged in the Asia-Pacific region due to an increase in air passenger traffic, which has also increased the output of major aircraft manufacturers.

The requirement for performance coatings like polyurethane coating to be used in aircraft for corrosion resistance would also rise with an increase in the production rate of major aircraft manufacturers, favourably affecting the performance coating manufacturer for revenue generation. In the transportation industry, key businesses are expanding their supply networks and building lasting partnerships with end consumers.

Manufacturers are also making significant research investments to provide innovative products at competitive prices while adhering to legal requirements. Green technology is anticipated to become a prominent technology soon. Even more, some manufacturers have created coatings that lessen the risk of fire and the formation of toxic chemicals while simultaneously reducing the spalling of concrete.

To create innovative products at a lower cost while adhering to regulatory requirements, manufacturers are also making significant research investments. It is predicted that green technology will become a dominant technology soon. Manufacturers have even created coatings that lessen the risk of fire and the formation of harmful chemicals, as well as concrete spalling.

Ample investments unfold multiple opportunities

Performance coatings are varnishes used to enhance the performance of surfaces and are resistant to high temperatures, corrosion and abrasion. A performance coating is an affordable

option for delivering cosmetically engaging, durable finishes to a product.

It is an effective technology that is environment-friendly and comes in a variety of colour combinations. It can also be used in minute-sized components. Performance coatings satisfy the primer coat as well as basecoat requirements.

Performance coatings are used broadly in the fields of automotive and aerospace coatings, industrial coatings, powder coatings, mining and mineral industry, wastewater treatment, infrastructure, power, oil and gas and marine sectors.

Performance coatings work in a wide range of conditions and have a good record of adjusting faster with the surfaces. Its end use includes application on large and small equipment, components, repair & refurbishment and in almost all light and heavy industrial segments.

Performance coatings can ideally be used on walls, floors, railings, food and beverage facilities, schools, healthcare facilities, occupied or confined spaces and office buildings. They are compatible with wood, aluminium, steel, metal, masonry, drywall, concrete and galvanized metal surfaces. Performance coatings can be classified on the basis of product type into alkyd, acrylic, enamel, epoxy and primer.

The Indian government is implementing several initiatives, particularly programs like AMRUT and housing for all, which are projected to increase demand for interior paints.

Asia-Pacific is the largest market for performance coatings. Fast-paced urbanization in China and Brazil are strong drivers for the performance coatings market in these countries.

Brazil holds more than half of the total South American paint and coatings market and will witness growth due to developments in the marine, protective coatings, oil and gas, automotive refinishes and plastic coating sectors.

This unfolds opportunities for ample investments in the industrial infrastructure sector and proportionally stimulates the demand for performance coatings and paints. Coatings consumption in China is reflecting high growth potential as a result of the policies of the Chinese government to improve its infrastructure in terms of sustainability and efficiency. In India, performance coatings hold more than quarter of the paint and coatings market share.

The Indian paint and coating industry is also reporting healthy growth with government focus on domestic manufacturing and country's emergence as new manufacturing hub. Besides, the introduction of smart cities in India in the near future will boost the coatings sector in the infrastructure industry.

Players in the paints and coatings industry are entering into joint ventures in order to strengthen their respective positions in the various segments of the potential coatings market.

Besides AkzoNobel and PPG, the other major players in performance coatings are Henkel, Axalta, Valspar, BASF, DuPont, Sherwin-Williams Co., ICI Paints and Kansai.

The performance coatings market is flourishing in BRIC countries and manufacturers are unfolding new opportunities. India, Brazil and China are progressing in the performance coating business and promise a potential market for performance coatings in the coming years.

The research report presents a comprehensive assessment of the market and contains thoughtful insights, facts, historical data and statistically-supported and industry-validated market data and projections with a suitable set of assumptions and methodology. The report provides analysis and information by categories such as product type, geographies and applications.

These insights are based on a report on BRIC Performance Coatings Market by Future Market Insights

Indian performance coating industry is anticipated to see significant investments from new entrants in addition to capacity expansions and Greenfield projects by current paints and coating companies.

Middle East manufacturers join forces in new association championing the region's $4,700m paints and coatings sector

The leading paints and coatings manufacturers in the Middle East have officially launched Middle East Paints & Coatings Association (MEPCA) and received necessary government approvals.

Founding member companies include AkzoNobel, Altakamol (Sheibani Group), Asian Paints, Axalta, Caparol Paints, Hempel, Jotun, National Paints, PPG, RAR Holding and Kaizen Paints Middle East (KPME) with the backing and support from the World Coatings Council and Vincentz Network.

“At long last, we have a joint platform for our industry in the region. We will collaborate for the benefit of all members and the coatings sector in general. Over time, we strive to grow our membership to include all relevant paints and coatings manufacturers in the Middle East,” said the inaugural Chairman of MEPCA, Abubaker Sheibani, Group CEO, Sheibani Group/Altakamol International, “there is no shortage of paints and coatings expertise in our region of the world and MEPCA will play an instrumental role in taking forward our future success.”

He will be supported by Vice Chairman Martin Rosocha, Managing Director ME & Africa, Caparol Paints, and Treasurer Jasbir Gill, Regional Director Middle East and Africa, AkzoNobel.

The formation of MEPCA, made up of the most senior leaders in each company, was prepared and driven by the World Coatings Council (WCC) and Vincentz Network. President Tom Bowtell and Global Business Director Coatings Juergen Nowak, respectively. MEPCA's work will focus on paints and coatings in all segments – adhesives and sealants, automotive refinish, coil, architectural/decorative, general industrial and OEM, marine, packaging and containers, powder, transportation, machinery and wood.

As the voice of the industry, MEPCA will engage with industry stakeholders to

facilitate their connection, share knowledge, improve business conditions, and contribute to the international dialogue.

Analysts have estimated that the Middle East paints and costings market is worth around $4,700 million – and could rise to as much as $7,500 million by 2032. Around 75% of the regional demand comes from construction (decorative and protective) and marine coatings with the rest from OEM sector.

The Middle East paints and coatings industry supports the region's economic diversification by producing its products in the region and supplying most of its products to domestic markets.

“We will work closely with regulators, producers, and industry experts to ensure our growth, continued business success, and the long-term sustainable development of our industry, starting a new era of cooperation. I am thrilled and proud to be its founding Chairman as we embark on this next stage of our journey,” said Mr Abubaker Sheibani.

Benjamin Moore reveals Blue Nova 825 as its Color of the Year 2024

Benjamin Moore, released its Color of the Year 2024 as Blue Nova 825 – an intriguing blend of blue and violet that sparks adventure, elevates, and expands horizons. Inspired by the brilliance of a new star formed in space, Blue Nova beckons us to unknown places in search of new experiences.

"Blue Nova 825 is an alluring mid-tone that balances depth and intrigue with classic appeal and reassurance," said Andrea Magno, Color Marketing & Development Director at Benjamin Moore. "The Color Trends 2024 palette tells a story of duality – juxtaposing light against dark, warm and cool, showcasing complementary and contrasting color pairings. These contrasts invite us to break away from the ordinary to explore new places and collect color memories that shape the hues used in our homes."

Benjamin Moore announced this year's space-inspired color at Blue Origin's Orbital Launch Site in Cape Canaveral, FL. As an authority in color and design, Benjamin Moore partnered with Blue Origin and its nonprofit Club for the Future to mutually inspire and mobilize future generations about STEM education and careers in the space industry. The organizations will reimagine design at local community hospitals, create space-themed experiences at upcoming events, and more.

Leading the way for Benjamin Moore Color Trends 2024, Blue Nova 825 provides eye-catching color with a nod to the night sky and creates a true presence in the home. Pairing colors that are as diametrical as they are captivating, Benjamin Moore's latest Color Trends palette for 2024 includes ten hues to help blend traditional and modern design styles.

PHOTO: BENJAMIN MOORE

Earlier, Benjamin Moore had announced the launch of Element Guard®, its newest premium exterior paint specially formulated to tackle one of the most difficult painting environments: high moisture.

Designed to withstand wind-driven rain, excessive humidity, and other harsh weather conditions, Element Guard® exterior paint is ideal for use on various exterior substrates such as vinyl and cedar siding, wood, brick, and more. The paint can resist rain as soon as 60 minutes after application and be applied in temperatures as low as 35°F, extending the painting season and assuring that professionals can paint with confidence. With excellent adhesion, resistance to cracking and peeling, and a mildew-resistant coating, users can count on Element Guard® to deliver durable, long-lasting results.

"Element Guard® was developed to ensure that every residential exterior not only boasts beautiful color that lasts, but is protected against various weather conditions," said Brad Henderson, Senior Product Manager at Benjamin Moore. "Engineered with its proprietary formula and backed by a limited lifetime warranty, this innovative solution enables users to paint with confidence and offers greater flexibility to complete exterior paint jobs with professional results in even the most challenging regions."

To complement any exterior design style, Element Guard® can be tinted in 3,500+ Benjamin Moore colors, including a curated Colors for Vinyl palette proven to avoid sun-induced warping. It is available in Flat, Low Lustre and Soft Gloss finishes.

Research reveals how humidity affects atmospheric corrosion of aluminum metal

Scientists at Lawrence Livermore National Laboratory (LLNL), USA, performed simulations using the lab's supercomputer Ruby to uncover physical mechanisms that explain why humidity controls the rate of atmospheric corrosion of aluminum metal. Their research is featured in the *ACS Journal of Applied Materials and Interfaces*.

Accurate predictions of aluminum component lifetimes depend on assessments of corrosion rates. Engineering-scale models used for making system-level lifetime predictions are expressed in terms of coupled physical and chemical mechanisms including sorption, transport and chemical reactions. These mechanisms are inherently multiscale, which complicates both model form development and calibration.

Rates for atmospheric aluminum corrosion depends on relative humidity, which measures the amount of water present as vapor around the part. Understanding which processes give rise to these rate effects can help constrain the form of engineering lifetime models in terms of fundamental physical parameters.

When bare aluminum surfaces are exposed to air, they quickly react to form aluminum oxide. Water vapor in the surrounding humid air then adsorbs onto these oxide surfaces forming a nanoscopic film whose thickness depends on the relative humidity. Condensed surface water provides a medium for metal ions to dissolve and move through diffusion, which is important in the formation and growth of corrosion pits, but the confined nanoscopic dimensions can induce unusual effects.

To better understand how aluminum ions behave under confinement in water on surfaces, the team turned to all-atom molecular dynamics (MD) simulations for insights. MD makes comparatively few assumptions regarding how atoms interact and directly simulates a trajectory of atomic motions that can be post-processed to obtain material property data.

"Because diffusive transport is a comparatively slow process, we had to carefully select how to model atomic interactions," said LLNL scientist Matt Kroonblawd, a co-author of the study. "Classical reactive molecular dynamics offers a desirable trade-off between accuracy and accessible time scales. Using reactive MD meant that we did not need to assume the structure of the aqueous aluminum species or the specific chemistry of the oxide surface."

From their simulations, the team observed that aluminum ions tend to localize near the air-water interface and were completely absent near the oxide. This phenomenon was attributed to both the surface polarization of the water film and the rigid ice-like phase of water that forms near the oxide surface.

Interplay between these two interfacial phenomena resulted in height-dependent transport properties within the water film. Atoms diffuse very slowly near the oxide interface and have increasing diffusivity as the air-water interface is approached. Thickness of the surface water depends on relative humidity, which correlates these nanoscale confinement effects with empirically measured rates for atmospheric corrosion of aluminum.

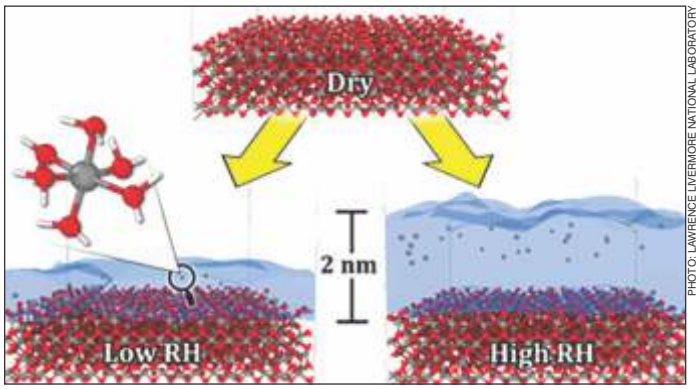


PHOTO: LAWRENCE LIVERMORE NATIONAL LABORATORY

Metal oxides exposed to air form a nanoscale water film over the surface whose thickness depends on relative humidity. All-atom molecular dynamics simulations predict that dissolved aluminum ions inside the film will localize near the water's surface, where they diffuse much more quickly than they do closer to the oxide. Lowering humidity increases confinement with the thin film, slowing the rate of atmospheric corrosion.

"Confinement effects within oxide-adsorbed water films are well-documented in the literature, but this new insight on their direct impact on aqueous ion transport is tremendously useful in understanding the mechanisms of atmospheric corrosion," explained LLNL scientist Jeremy Scher, lead author of the study.

The consequences of nanoscale confinement on corrosion rates became clearly apparent when the team upscaled their MD results to the continuum scale. A reductionist 1-dimensional continuum model of an aluminum corrosion pit was developed, which incorporated the ion diffusion coefficients calculated from the MD simulations. This simple model showed that corrosion rates can be diffusion limited under atmospheric conditions and are therefore strongly influenced by relative humidity.

"The results from this study highlight how essential it is to capture unusual nanoscale effects and their dependence on humidity when modeling atmospheric corrosion at larger length scales," Scher said.

This study is part of a new multiscale modeling effort to extend the Reaction-Sorption Transport and Mechanics (or ReSorT-M) toolkit, a modeling framework used by the Materials Aging and Compatibility (MAC) group to help inform engineering decisions in Weapons and Complex Integration programs.

"Accurately determining the water layer's thickness on the metal surface and understanding how humidity and temperature affect its properties are crucial for assessing corrosion concerns for programmatic needs," said LLNL scientist Sylvie Aubry, a co-author in the study, and the ReSorT-M team lead.

LLNL researchers Stephen Weitzner, Tae Wook Heo, Yue Hao, Stephen Castonguay and Susan Carroll also contributed to this work.

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Researchers develop steam condenser coating that could boost global power efficiency

If coal and natural gas power generation were 2% more efficient, then, every year, there could be 460 million fewer tons of carbon dioxide released and two trillion fewer gallons of water used. A recent innovation to the steam cycle used in fossil fuel power generation could achieve this.

Researchers at the University of Illinois Urbana-Champaign, USA, have developed a coating for steam condensers used in fossil fuel steam-cycle generation that is made with fluorinated diamond-like carbon, or F-DLC. The researchers reported in the journal *Nature Communications* that this coating could boost the overall process efficiency by 2%. In addition, they demonstrated the coating's suitability for industrial use by performing the longest durability test ever reported.

“The reality is that fossil fuels aren't going away for at least 100 years,” said Nenad Miljkovic, a professor of mechanical science and engineering at UIUC and the project lead. “A lot of CO_2 is going to be emitted before we get to a place where we can lean on renewables. If our F-DLC coating were adopted globally, it would noticeably curtail carbon emissions and water usage for the existing power infrastructure.”

Fossil fuel power generation depends on a process called the steam cycle, in which fuel is burned to boil water, the resulting steam spins a turbine and the turbine drives an electric generator. The steam then reaches a condenser which both reclaims water from the steam and maintains a pressure difference across the turbine so the steam flows. Improving the condensers' heat transfer properties would allow a pressure difference to be maintained while burning less fuel.

The researchers' new F-DLC coating improves heat transfer because the material is hydrophobic. When the steam condenses into water, it does not form a thin film that coats the surface, like water does on many clean metals and their oxides. Instead, the water forms droplets on the F-DLC surface, putting the steam into direct contact with the condenser and allowing heat to be directly transferred. The researchers found that this improved the heat transfer properties by a factor of 20, which translates to a 2% overall process boost.

“It's remarkable that we can achieve this with F-DLC, something that just uses carbon, fluorene and a little bit of silicon,” said Muhammad Hoque, a postdoctoral research associate and the study's lead author. “And it can coat pretty much any common metal, including copper, bronze, aluminum and titanium.”

To demonstrate F-DLC's durability, the researchers subjected coated metals to steam condenser conditions for 1,095 days, the longest test reported in the literature. The coated metals maintained their hydrophobic properties for this entire length of time. The researchers also found that the coated metals maintained their hydrophobic properties after 5,000 scratches in an abrasion test.

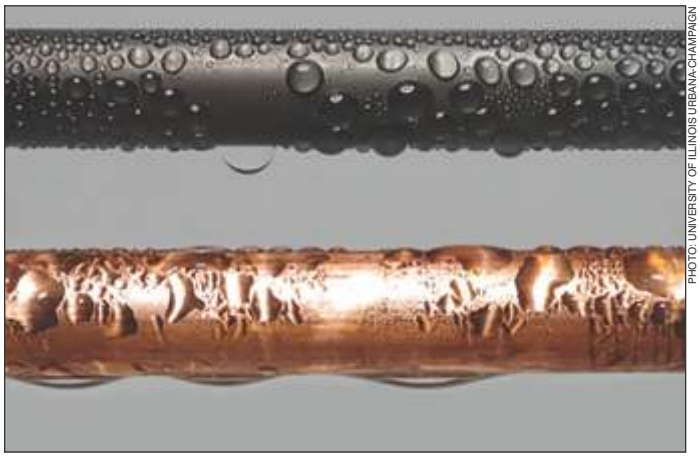

PHOTO: UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Copper steam condenser pipes coated with F-DLC (top) and without a coating (bottom). The F-DLC coating allows the condensed water to form into droplets rather than a thin film covering the pipe.

The research team is now collaborating with UIUC's Abbott Power Plant to study the coating's performance for six months of steady condensation exposure under industrial conditions.

“If all goes well, we hope to show everyone that this is an effective solution that is economically viable,” Miljkovic said. “We want our solution to be adopted, because, although the development of renewable energy should absolutely be a priority, it's still very worthwhile to continue improving what we have now.”

New paint gives extra insulation, saving on energy, costs, and carbon emissions

Stanford University scientists have invented a new kind of paint that can keep homes and other buildings cooler in the summer and warmer in the winter, significantly reducing energy use, costs, and greenhouse gas emissions.

Space heating and cooling accounts for about 13 percent of global energy use and about 11 percent of greenhouse gas emissions. The new paints reduced the energy used for heating by about 36 percent in experiments using artificial, cold environments, according to a study published in the *Proceedings of the National Academy of Sciences*, notes Mark Golden in a press release. They reduced the energy needed for cooling by almost 21 percent in artificial warm conditions. In simulations of a typical mid-rise apartment building in different climate zones across the United States with the new paint on exterior walls and roofs, total heating, ventilation, and air conditioning energy use declined 7.4 percent over the course of a year.

"Energy and emissions from heating are forecast to continue to fall due to energy efficiency gains, but air conditioning use is rising, especially in developing economies in a warming world," said the study's senior author, Yi Cui, professor of materials science and engineering, of energy science and engineering, and of photon science at SLAC National Accelerator Laboratory.

"For both heating and air conditioning we must reduce energy and emissions globally to meet our zero-emissions goals," said Cui, who directs the Precourt Institute for Energy and the Sustainability Accelerator, both within the Stanford Doerr School of Sustainability. "How to reduce heat exchange between human living and work spaces and their surroundings is getting more attention, and new materials for enhanced insulation – like low-emissivity films for windows – are in demand."

A colorful solution

Current low-emissivity paints usually have a metallic silver or gray color, the aesthetics of which limit their use. The newly invented paints have two layers applied separately: an infrared reflective bottom layer using aluminum flakes and an ultrathin, infrared transparent upper layer using inorganic nanoparticles that comes in a wide range of colors. The infrared spectrum of sunlight causes 49 percent of natural heating of the planet when it is absorbed by surfaces.

For keeping heat out, the paint can be applied to exterior walls and roofs. Most of this infrared light passes through the color layer of the new paints, reflects off the lower layer, and passes back out as light, not being absorbed by the building materials as heat. To keep heat inside, the paints are applied to interior walls where, again, the lower layer reflects the infrared waves that transfer energy across space and are invisible to the human eye.

Specifically, up to about 80 percent of high mid-infrared light is reflected by the paints, doing most of the work of keeping heat inside during cold weather and outside during hot weather. The color layer also reflects some near-infrared light, enhancing the reduction in air conditioning. The research team tested their paints in white, blue, red, yellow, green, orange, purple, and dark gray. They were 10 times better than conventional paints in the same colors at reflecting high mid-infrared light, the researchers found.

Not just for buildings

The paints can be applied beyond buildings to improve energy efficiencies elsewhere. For example, they could cover trucks and train cars used for refrigerated transportation, in which cooling costs can take up to half the transportation budget.

"Both layers can be sprayed onto assorted surfaces of various shapes and materials providing an extra thermal barrier in many different situations," said Yucan Peng, co-lead author of the study.

The researchers also evaluated how practical their paints would be in various situations. Both layers are water-repellant, which should enhance stability in humid environments. Painted surfaces can be cleaned easily with wet cloth or water flushing, the researchers report. Furthermore, the paints' performance and aesthetics were not diminished after continuous exposure for one week to high temperature (176 degrees Fahrenheit), low temperature (-320.5 degrees Fahrenheit), as well as high acidic and low acidic environments. The paint actually increased the use of air conditioning slightly in some U.S. cities, but no location showed an increased total HVAC load.

"Our team continues to work on refining the paint formulations for practical applications," said the study's other co-lead author, Jian-Cheng Lai, a postdoctoral scholar advised by Zhenan Bao, professor of chemical engineering. "For example, water-based solutions would be more environmentally friendly than the organic solvents we used. That could facilitate the commercialization of the paints."

PHOTO: YUCAN PENG / STANFORD UNIVERSITY

Objects of different materials in various shapes, coated with the new paints.

Date	Course	Place	Organizer	Contact Details
OCT 16 – 20, 2023	CSWIP 3.1 Senior Welding Inspector Level II	Kochi	Blastline Institute	T: (484) 2408477 E: info@blastlineinstitute.com W: blastlineinstitute.com
OCT 30 – NOV 03, 2023	Cathodic Protection Program – Level 1	Mumbai	Corcon Institute of Corrosion	T: (022) 24106494 E: info@corrosionindia.org W: corrosionindia.org
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OCT 30 – NOV 03, 2023	BGAS Grade 1 Painting Inspector – Offshore	Kochi	Blastline Institute	T: (484) 2408477 E: info@blastlineinstitute.com W: blastlineinstitute.com
NOV 06 – 10, 2023	CSWIP 3.2 Senior Welding Inspector Level III	Kochi	Blastline Institute	T: (484) 2408477 E: info@blastlineinstitute.com W: blastlineinstitute.com
NOV 13 – 17, 2023	BGAS Grade 2 Painting Inspector	Kochi	Blastline Institute	T: (484) 2408477 E: info@blastlineinstitute.com W: blastlineinstitute.com
NOV 13 – 17, 2023	BGAS Grade 1 Painting Inspector - Offshore	Kochi	Blastline Institute	T: (484) 2408477 E: info@blastlineinstitute.com W: blastlineinstitute.com
NOV 20 – 24, 2023	CSWIP 3.1 Senior Welding Inspector Level II	Kochi	Blastline Institute	T: (484) 2408477 E: info@blastlineinstitute.com W: blastlineinstitute.com
NOV 27 – DEC 01, 2023	CSWIP 3.1 Senior Welding Inspector Level II	Kochi	Blastline Institute	T: (484) 2408477 E: info@blastlineinstitute.com W: blastlineinstitute.com
DEC 04 – 08, 2023	CSWIP 3.1 Senior Welding Inspector Level II	Kochi	Blastline Institute	T: (484) 2408477 E: info@blastlineinstitute.com W: blastlineinstitute.com
DEC 04 – 09, 2023	Basic Coatings Inspector / CIP Level 1 Course	Kochi	Corcon Institute of Corrosion	T: (022) 24106494 E: info@corrosionindia.org W: corrosionindia.org
DEC 11 – 15, 2023	Certified Coatings Inspector / CIP Level 2 Course	Kochi	Corcon Institute of Corrosion	T: (022) 24106494 E: info@corrosionindia.org W: corrosionindia.org
DEC 11 – 15, 2023	BGAS Grade 2 Painting Inspector	Kochi	Blastline Institute	T: (484) 2408477 E: info@blastlineinstitute.com W: blastlineinstitute.com
DEC 11 – 15, 2023	Certified Inspectors Course – CIP Level 2 Course	Kochi	Corcon Institute of Corrosion	T: (022) 24106494 E: info@corrosionindia.org W: corrosionindia.org
DEC 18 – 22, 2023	CSWIP 3.1 Senior Welding Inspector Level II	Kochi	Blastline Institute	T: (484) 2408477 E: info@blastlineinstitute.com W: blastlineinstitute.com
JAN 08 – 12, 2024	Cathodic Protection Program – Level 2	Mumbai	Corcon Institute of Corrosion	T: (022) 24106494 E: info@corrosionindia.org W: corrosionindia.org

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15th International Conference on Surface Protective Coatings

With more than 220 delegates in attendance, 16 sponsors and 15 exhibitors, the 15th International Conference on Surface Protective Coatings was held along with the 20th Anniversary of SSPC India at Hotel Lalit, Mumbai, September 15 & 16, 2023. Prominent among the sponsors were: AkzoNobel, Kanasi Nerolac, Berger Paints, Shalimar Paints, Clean Coats, Growel Paints, Jotun, Cardolite, JSW Paints, etc. The conference and exhibition was held in adjacent halls giving a good opportunity for the participants to attend technical sessions as also interact with exhibitors.

The inaugural program started on the dot with the National Anthem and lighting of the lamp. In his welcome speech, Prof A. S. Khanna, Chairman of SSPC India stressed the need for such focussed conferences which discusses important paint issues. Discussions on paint coatings also becomes very important keeping in-view the total paint market which assures jobs to many and is a revenue generator, he said. In his inaugural speech Mr B. Ramakrishnan, Senior Consultant and Advisor, ORP & BOSS, dealt in detail about the global paint market and current scenario. The Chief Guest Prof Dr Sanjay Mathur, Director, Institute of Inorganic Chemistry, University of Cologne gave a brilliant insight into the 'functional' aspects of coatings. He stressed that use of several techniques such as nano-technology and others that protective coating can also be made to achieve functions such as self cleaning, self healing, anti microbial action etc. Dr B. P. Mallik from Growel Paints, covered the coating scenario within the Indian Industry. He stressed the need of adopting waterborne technology in India and be at par on other international technologies. Mr Amrit Rekhi, Vice President, SSPC India then initiated the inauguration of the expo and released the souvenir.

The first technical session on Infrastructure had interesting discussions on floor coatings, coatings for infrastructure and road marking coatings. Two talks on road marking paints by Mr R. K. Yadav of Asian Paints PPG, and the other by Mr Ishan Raveshia of VOXCO highlighted the present situation of road marking paints. The next session on Sustainability was chaired by Mr B. P. Mallik with Mr Sanjay Chowdhury of Berger Paints giving a talk on Value Innovation and its Impact on Sustainability. The highlight of the session was, a talk on Solar Heat Reflective Coatings for energy savings by Mr P. P. Joshi of Thermogreen Cool Coat Pvt. Ltd., and the other on Green Coatings by Mahesh Aradhye of Shalimar Paints Ltd.

Technical session three was on Protective Coatings, chaired by Mr L. S. Nikam of Kansai Nerolac. He invited Mr Sankara Papavinasam from Canada, who gave a very lucid presentation on pipeline coatings giving details on present systems and standards being followed. Mr Santosh Kumar of AXEES very nicely innumerate the issue of paint coating management. He told how people do not strictly follow the specifications, goof in surface preparation and final inspection. Mr Tapan K. Dhar of Berger Paints gave a presentation Innovation Trends in Protective Coatings.

The two keynote talks by Mr Mukesh Madhup of Amatech Innovation and the other on semiconductors and surface engineering opened the eyes of paint technologists about the several additional avenues in paint coatings. Some people also expressed fear over job reductions if artificial intelligence (AI) becomes more effective. The presentation by Mr S. Ravichandran of Berger Paints, on coating applications related to design life was quite interesting. The salient features of the next two sessions were: A talk on the market on nano-technology by Mr Swapan Ghosh of Harind Chemicals and Pharmaceuticals, which raised hopes of the use of nano technology in the coming decade. A talk by Mr Sachin Joshi of Greenovac Speciality Coatings on the use of single component coatings over multi layer

Prof A. S. Khanna, Chairman, SSPC India was honored with The Visionary Leadership Award by the SSPC India team at the event.

At the 15th International Conference on Surface Protective Coatings and the 20th Anniversary celeberations of SSPC India.

coating resulted in hope for easy paint formulations in the future.

The highlight of the 15th International Conference was the celebrations of the 20th Anniversary of SSPC India which was initiated in the year 2003. A gala cultural night was arranged with a special band for Indian music. This opportunity was also used to distribute various awards as follows:

ASK Endowment Awards – constituted by Prof A. S. Khanna from IIT Bombay after his retirement to promote Corrosion Science and Surface Engineering. This year, the following five awards were given to Prof Dr Sanjay Mathur, Director, Institute of Inorganic Chemistry, University of Cologne for his Special Achievements in the field of Surface Engineering; Mr Mahesh Gulab Walnuj of NML Jamshedpur, pursuing his Ph.D with IIT Bombay on the use of Zinc Based Coatings got best Ph.D Award; Mr Sanjay Chowdhury, Berger Paints Ltd, got a Special Appreciation Award for using management and special skills to enhance the business; Mr Raju Paleja of Naman in Store, for Technology Promotion for showing an excellent example of using Surface Engineering to create a very big business in decorative furniture.

Thermogreen Cool Coat Pvt. Ltd., got an Appreciation Award for Promoting Coatings for Climate Change; Mr Santosh Kumar of AXEES, the Special Nerolac Industrial Award; Mr Khalid, Tata Pigments, the Special VOXCO Industrial Award; Dr Ruchi Grover, Director, Oxycoat, the Berger Special Award for Innovation to Entrepreneurship; Mr Dev Atul Shukla of dR India, the Berger Special Award for adopting Good Paint Practices.

In addition about 15 awards were given to all those who were associated with SSPC India for the last 20 years and contributed for the growth of SSPC India to reach this level: Mr B. Ramakrishnan, Ex AkzoNobel, Mr Amrit Rekhi, Kansai Nerolac; Mr S. Ravichandran, Berger Paints; Mr Sujit Sinha, Growel Paints; Mr Gokul Sutradhar, Shalimar Paints; Mr Jaideep Sen, Ex Asian Paints; Mr Dhirendra Singh, Akzonobel; Mr H. S. Shankar, Clean Coats, Mr Rahul Sharma, International Zinc; Mr Ishan Raveshia, VOXCO, Mr K. J. Aiyengar, Hon. Treasurer, SSPC India, Mr Neerav Thacker, Hon Secretary, SSPC India; and Mr Rakesh S. Kanojiya, SSPC India.

The SSPC India team mentionned Prof Khanna's untiring and dedicated effort the last 20 years to keep the flag and spirit of SSPC India high and organize innumerable activities ranging from trainings, evening lectures and International conferences. The team then conferred a special award called: The Visionary Leadership award to Prof A. S. Khanna.

Date	Event	Venue	Organizer	Contact Details
NOV 15 – 17, 2023	CHINACOAT / SF CHINA	Shanghai New Intl Expo Centre	Chinacoat Exhibition Ltd Shanghai, China	E: exhibition@new-expostar.com W: chinacoat.net
FEB 06 – 08, 2024	MIDDLE EAST METALLURGY CORROSION & COATINGS EXPO 2024	Abu Dhabi, UAE	Aldrich Energy	T: +971 56 903 2809 E: mathew@aldrichme.com W: mecocmiddleeast.com
FEB 22 – 24, 2024	PAINTINDIA 2024	Bombay Exhibition Centre Mumbai, India	NovaExpo Exhibitions and Conferences (India) Pvt Ltd.	E: paintindia.expo@colorpub.in W: paintindia.in
FEB 27 – MAR 01, 2024	INTERLAKOKRASKA 2024	Expocentre Fairgrounds Moscow, Russia	Expocentre Moscow	T: 8 (800) 7073799 E: centr@expocentr.ru W: interlak-expo.ru
MAR 03 – 07, 2024	AMPP ANNUAL CONFERENCE + EXPO	New Orleans Louisiana, USA	AMPP	W: ace.ampp.org
MAR 19 – 24, 2024	EXPO-SURFACE KIELCE	Exhibition & Congreess Centre, Kielce, Poland	Targi Kielce S.A.	T: +48 41 365 12 22 E: biuro@targikielce.pl W: targikielce.pl
MAR 26 – 28, 2024	EUROCOAT 2024	Paris Expo, Porte de Versailles, France	Infopro-Digital	W: eurocoat-expo.com
APR 09 – 12, 2024	PAINTEXPO 2024	Karlsruhe, Germany	Leipziger Messe GmbH	T: +49 341 678 0 E: info@leipziger-messe.de W: leipziger-messe.de
APR 15 – 17, 2024	MIDDLE EAST COATINGS SHOW	Dubai World Trade Centre Dubai, UAE	dmg.events	T: +971 4 4453773 E: paddyoneill@dmgevents.com W: middleeastcoatingsshow.com
APR 30 – MAY 02, 2024	AMERICAN COATINGS SHOW 2024	Indiana Convention Center Indianapolis, Indiana, USA	American Coatings Association	E: chames@paint.org W: american-coatings-show.com
MAY 15 – 17, 2024	INTERNATIONAL COATING INDUSTRY EXPO	Poly World Trade Centre Guangzhou, China	China Coating Alliance International	T: +80-20-29193563 E: sfexpo@hotmail.com W: coatexpo.cn
JUN 12 – 16, 2024	COATINGS EXPO VIETNAM 2024	SECC, Ho Chi Minh City, Vietnam	VEAS	T: +84 28 38488561 E: info@veas.com.vn W: coatings-vietnam.com
JUN 19 – 22, 2024	SURFACE & COATING 2024	BITEC, Bangkok, Thailand	RX Tradex	T: +66 2686 7222 E: surfaceandcoatings@rxtradex.com W: surfaceandcoatings.com
SEP 11 – 15, 2024	ASIA PACIFIC COATINGS SHOW	Convention Centre Jakarta, Indonesia	dmgevents	T: +971 44453773 E: paddyoneill@dmgevents.com W: asiapacificcoatingsshow.com
SEP 19 – 21, 2024	EXPO PAINT AND COATINGS 2024	ICCB, Dhaka, Bangladesh	Toredo Fairs India Pvt Ltd	T: (91) 98453 63225 E: info@expopaintcoating.in W: expopaintcoating.in

Please note, schedules are subject to last minute changes.

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