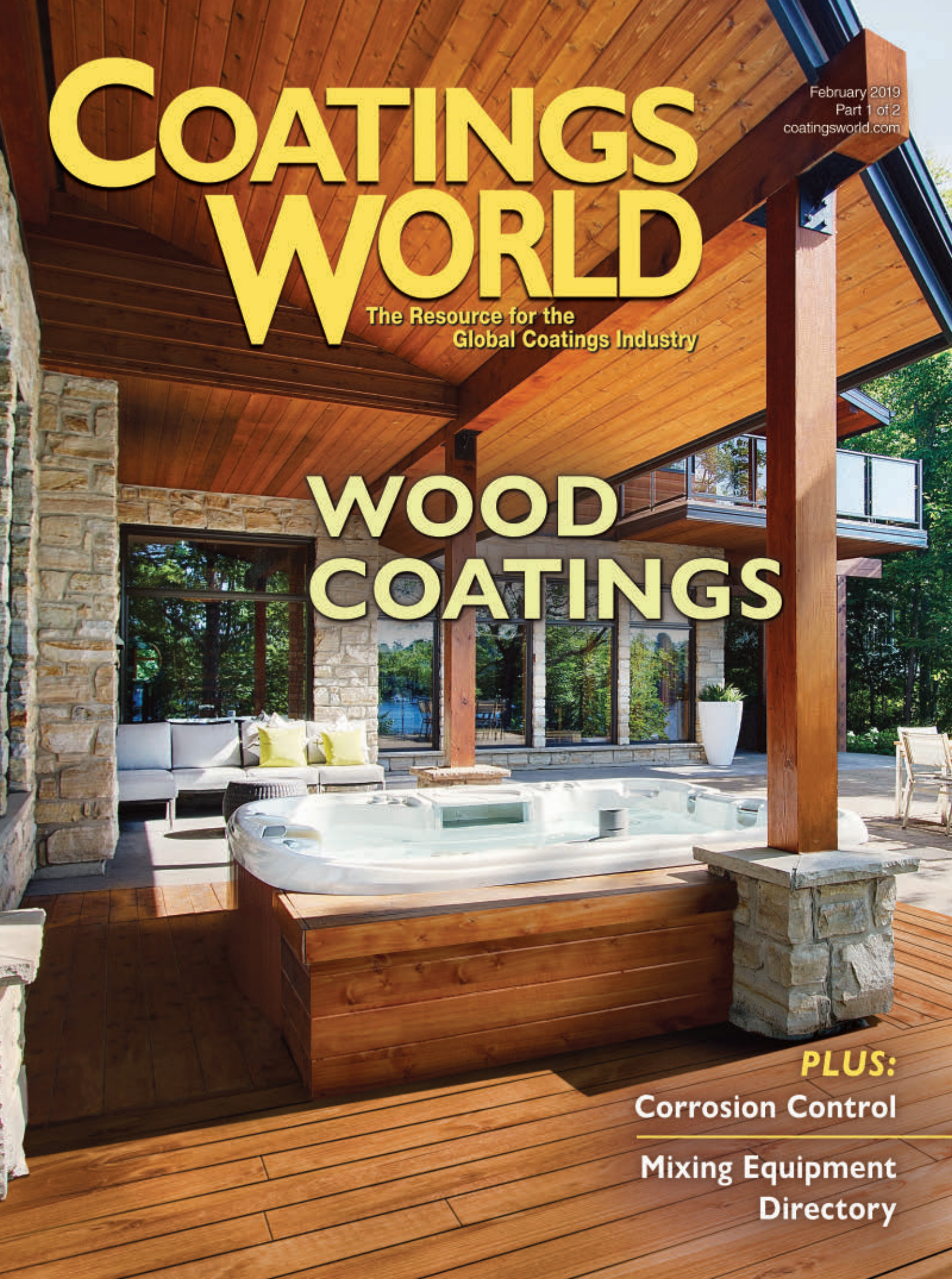

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The Resource for the Global Coatings Industry

February 2019
Part 1 of 2
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Global Wood Coatings Market

This month's issue of *Coatings World* is focused on the wood coatings market. According to research firm Mordor Intelligence, the global wood coatings market was valued at $8818.46 million in 2017. It is expected to witness a moderate CAGR during the forecast period 2018 to 2023. Furniture and fixtures application is expected to be the largest segment with a share of approximately 60 percent, followed by decks and cabinets in 2017.

Wood coatings are used in both industrial and residential areas.

This month's feature article, *Wood Coatings Market,* (pg. 32) focuses on both the DIY and professional sides.

One important factor impacting wood coatings is the housing market. An improved housing market is great news for wood coatings manufacturers.

"The housing market is directly linked to the wood coatings market, which is why the housing market recovery had a strong effect on our market," said Anthony Woods, segment marketing director wood coatings, AkzoNobel.

"We are seeing various factors drive growth in the coatings market, including a rise in existing home sales, new construction, employment rate and consumer confidence," noted Jim Lamont, senior marketing manager, wood care at PPG.

Our Africa correspondent, Shem Oirere, also focused on the wood coatings market in his column, *Housing, Furniture Boom to Drive Kenya's Wood Coatings Market* (pg. 30).

He reported that there is growing optimism in the future performance of the wood coatings market as Kenya revives plans for the construction of two million housing units across the country's urban areas with the first 500,000 housing units expected by 2022.

"The Kenyan government has indicated interest in providing one million low cost houses and we expect that this will create a significant demand for paint," said Rakesh K. Rao group chief executive officer of Crown Paints. "We already have a range of economy paints and other products to meet this demand."

The company manufactures Crown wood finishes series such as aquavar varnish, multi-purpose clear varnish, oil varnish stains, polyurethane clear varnish, polyurethane wood seal, two-pack epoxy varnish and two-pack polyurethane varnish.

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PPG Named to Forbes' 2019 'Best Employers for Diversity' List

PPG has been named one of the "Best Employers for Diversity" in 2019 by *Forbes* magazine. *Forbes* ranked the top companies in the United States that demonstrate a dedication to diversity and inclusion in the workplace.

"PPG is honored to be recognized by *Forbes* for our ongoing commitment to providing a culture of diversity and inclusion for all of our employees," said Herve Tiberghien, PPG vice president, human resources. "The unique perspectives of PPG's diverse workforce enable us to meet challenges quickly, creatively and effectively, providing a significant competitive advantage in today's global economy."

The ranking of 500 employers across all industries in the United States is based on a survey of thousands of employees that examines employer diversity policies, as well as diversity in executive suites and on boards. PPG ranked No. 297 of the companies assessed by *Forbes*.

"The diversity of our employees allows PPG to solve our customers' own diverse needs in every corner of the globe and to continue to protect and beautify the world," said Tiberghien.

Michelman Opens Sustainability Center in Shanghai

Michelman celebrated the grand opening of its Michelman (China) Sustainability Center on Jan. 17, 2019, at the company's Shanghai offices located in the East Park of the Shanghai Pudong Kangqiao Industrial Zone.

The new Center is part of Michelman's aggressive growth plan in the Asia Pacific region and follows the opening of the Michelman Innovation Centre for Coatings, which opened in Mumbai last January.

"As a global developer of environmentally friendly advanced materials for industry, we believe in sustaining both the natural and business environments," said Ginger Merritt, VP, coatings and country manager, Michelman China. "In fact, our purpose is Innovating a Sustainable Future and reflects Green Growth, a pillar of China's 13th Five-Year Plan. Our unwavering values and passion for environmentally conscious innovation help companies in this region establish and achieve their product performance goals.

"With the exciting addition of the new MSC, we are furthering our commitment to helping the 13th FYP expand and reinforce green manufacturing with our water-based and sustainable expert materials," Merritt continued. "The MSC will foster both sustainable solutions and collaboration. It incorporates dedicated space, technical expertise, and technology and promotes collaborative innovation between partners, customers, service providers, and suppliers of multiple industries' value chains. This new facility will have a Technology & Marketing Office along with a fully equipped Development Center to develop solutions that are sustainable and green." ***CW***

Index to Companies

This index gives the starting page for a department or feature with a significant reference to a manufacturer of paint, coatings, adhesives and sealants Subsidiaries are indexed under their own names.


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Golden-Bronze 'Sahara' 2019 Automotive Color of the Year

For the first time in its five-year history, Axalta's Automotive Color of the Year is showcasing a color primed for vehicle customization both at manufacturing facilities and in the aftermarket.

Sahara, a golden bronze tone, offers warmth and richness for vehicles of all sizes – especially the expanding global truck and SUV markets – and can serve as the principal color for two-tone possibilities including black roofs, the company reported.

"At Axalta, we are seeing car designers leaning toward options for two-toning, accent roofs and stripes," said Nancy Lockhart, Axalta global color marketing manager. "When it comes to mass customization, Sahara is the type of color that can serve as the foundation for these premium options."

Borne from Axalta's ChromaDyne line of color coats formulated for global automotive manufacturers, Sahara is partly inspired by global trends for warmer shades highlighted in the company's Global Automotive Color Popularity Report. Yellow/gold vehicles are most popular in India and China while brown/beige vehicles increased in North America more than any other region.

Sahara is Axalta's fifth Color of the Year following Radiant Red (2015), Brilliant Blue (2016), Gallant Gray (2017) and StarLite (2018). StarLite, a pearlescent white, introduced coatings technology into the autonomous vehicle discussions. Axalta colors under development are tested for readability by autonomous sensors, and Sahara is formulated for visibility.

According to Dan Benton, Axalta Refinish color marketing manager, Axalta's Color of the Year is another example of how Axalta transfers OEM technology to the aftermarket and repair businesses.

"We get calls every year from some of the industry's best custom builders looking to use color to differentiate their products," he said. "We have Sahara formulated and ready-to-go in our industry-leading refinish brands including Cromax, Standox and Spies Hecker."

Sahara was selected as Axalta's 2019 Automotive Color of the Year.

"Sahara will excite and inspire the industry as it brings together timeless style and luxurious customization for a fashionably fierce finish," added Lockhart.

Axalta will kick off a year-long celebration of Sahara during the 2019 North American International Auto Show in Detroit. Highlights include a video reveal at the EyesOn Design awards program and prominent display during the Axalta-sponsored Charity Preview.

PPG Acquires Automotive Coatings Manufacturer Hemmelrath

PPG said it reached a definitive agreement to acquire automotive coatings manufacturer Hemmelrath. The transaction is expected to close in the first half of 2019, subject to customary closing conditions. Financial terms were not disclosed.

"This acquisition is another step forward in our strategic growth plan that will provide further value to our customers and shareholders," said Michael McGarry, PPG chairman and CEO.

Headquartered in Klingenberg, Germany, Hemmelrath is a family-owned manufacturer of coatings for automotive OEMs. With more than 450 employees, the company operates manufacturing facilities in Klingenberg and Erlenbach, Germany; Jilin, China; Duncan, South Carolina; and Indaiatuba, Brazil.

"The fit between Hemmelrath and PPG is complimentary. The acquisition will enhance PPG's automotive coatings offering, and add formulating and manufacturing solutions," said Rebecca Liebert, PPG SVP, automotive coatings.

BASF Analyzes 2018 Automotive Color Distribution

BASF released its annual global analysis of color distribution in the automotive market for 2018.

Developed by the company's Coatings division, the report entitled "BASF Color Report for Automotive OEM Coatings," finds that achromatic colors – white, black, gray and silver – still dominate the roads.

They cover almost 80 percent of cars produced worldwide. White is the most popular color among them. More than one-fourth of North American cars and nearly one-third of European vehicles are painted white.

More than half of the vehicles in Asia Pacific are white. Silver's popularity decreased slightly in comparison to the previous year.

Among the diverse range of color shades, blue is the most popular, followed by red. These chromatic colors tend to be more popular within the smaller vehicle segments, such as compact and subcompact cars. The overall amount of chromatic hues decreases significantly in the larger automobile segments. Here, there was a considerable increase in black and white compared to the previous year.

In 2018, the achromatics remained the most popular automotive colors for North America, accounting for roughly 75 percent of market production. Among the achromatic colors, white maintains the leading position. Besides the achromatic shades, consumers continued to demonstrate a growing affinity for red, specifically within the pickup and sports car segments. The diverse blue color space remained nearly the same compared to the prior year.

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Over the last 10 years, crossover utility vehicles have emerged as a dominant vehicle segment in North America. CUVs combine the qualities of SUVs, such as safety and driving convenience, with benefits such as fuel efficiency to offer appealing features to a wide array of drivers. White is the most popular color in this segment, followed by black and gray. Blues and reds are almost equally desired by car buyers.

"In coating large surfaces for the CUV segment, the industry looks to bring a suitable visual expression of the vehicle's perceived use and link it to the brand image," said Paul Czornij, head of automotive color design for BASF North America.

BASF's Coatings division continuously monitors trends in materials and colors and uses this data to predict which colors will play a key role in the future automotive market. Each year, the Coatings division's designers create Automotive Color Trends, an innovative collection of 65 new colors based on extensive research and in-depth analysis of global trends and cultural shifts that will influence automotive colors three to five years into the future.

Integrated into its color design innovations, BASF offers a range of sustainable coatings solutions for the automotive industry. Among these are coatings that enable a shortened application and curing process, which can reduce CO_2 emissions by up to 20 percent, waterborne basecoats that meet strict global regulations to minimize the VOC content, and coatings with a temperature management functionality whereby the car surface does not heat up as much as conventional coatings, minimizing the heat build-up in interiors.

H. Hendy Associates Completes New Corporate HQ for Behr

Interior architecture and planning firm H. Hendy Associates recently completed a new 230,000-square-foot corporate headquarters for Behr Paint Company, located in Santa Ana, California.

Hendy delivered a branded-office environment that reflects the history and culture of Behr and Kilz paints and primers, supports the company's growth and inspires existing and new talent.

The new office features a variety of unique, urban spaces infused with state-of-the-art business technology to support employee collaboration and cross-functional work. Spaces include formal meeting, training and war rooms; ad-hoc workstations to foster teamwork and ideation; data and innovation areas; and the Behr Den, an indoor-outdoor space featuring a large patio with tiered seating. The den can also be used as an event space and is designed to fit 500 people.

A hallmark of the new space is a 30,000-square-foot, R&D laboratory featuring unique graphics, art and access to natural light.

"Behr's new headquarters is a celebration of the company's dynamic ethos, innovative mindset and respected personnel," said Jennifer Walton, principal and project

director at H. Hendy Associates. "Our goal in this design was to create an intuitive workplace that gives employees a sense of community in a space that underscores the company's brand at every turn."

Drawing inspiration from the Behr and Kilz brand history, the office features two historic roads – Pacific Coast Highway and Route 66 –symbolizing Behr's California roots and Kilz's origin in St. Louis, Missouri.

The new work environment also supports the company's focus on health and wellness. Spaces include high exposed ceilings, natural light, a Zen garden-like atmosphere and walking paths.

"The new office design uniquely and seamlessly reflects our commitment to quality, innovation, value and performance — cornerstones of our success for more than 70 years," said Jeff Filley, president, Behr Paint Company. "Each space captures the brand's entrepreneurial spirit, commemorates our valued team members, imparts our unique company culture, and incorporates modern technology to enable us to fulfill our brand promise of delivering world-class products and services to our customers."

Axalta Named a Great Place To Work in Spain

Axalta was recognized as one of the best companies to work for in Spain by Great Place to Work.

"It is with immense pleasure and pride that our commitment to valuing people who are part of Axalta, and all our employees, has been recognized by Great Place to Work. And, in turn, it is also an acknowledgment of the fundamental values that underpin and define Axalta," said Kolja Hosch, head of country HR for Axalta EMEA.

"This is a great acknowledgment for every member of the Axalta team in Spain. We have worked hard to ensure we act as a united team, delivering the very best for each other as well as for our customers, and this recognition makes all that hard work and effort so very worthwhile," added Juan Antonio Rodríguez, Axalta HR leader for Spain, Portugal and Italy.

When analyzing companies, Great Place to Work evaluates five major areas: Credibility, respect, impartiality, pride and the companionship of workers.

Based on the feedback from the employees, the Great Place to Work report highlights four of Axalta's strengths: Companionship and the work environment, autonomy and trust in people, internal communication, and finally cultural diversity and integration of the workers.

HMG Introduces New Agricultural Coatings

HMG Paints is giving innovative coatings – vintage restoration, OEM production and equipment maintenance – a push into agricultural sectors across the UK and Ireland.

The HMG Agricultural and Construction Equipment product range provides tough and durable 1K enamels, premium high-performance 2K topcoats, chromate-free etch primers and more for agricultural and farm machinery, construction and materials

handling equipment, along with brushing and rolling synthetic enamels for restoration projects and maintenance.

"We are really looking forward to working within the Agricultural sector this year with all the new innovations in the farming industry. LAMMA (a UK farm equipment and services show) is a great place to meet up with existing customers and develop new partnerships," said Paul Edwards, HMG Paints industrial sales manager. "As a family-run business with family values at the core of operations, HMG is renowned for providing market leading products, along with hands-on, technical support on and off-site."

HMG produces paints in various color ranges including agricultural, commercial vehicle, RAL & British standard and even traditional steam train colors such as "Middle Brunswick Green," and maintains a color library of more than 200,000 colors.

PPG Completes COLORFUL COMMUNITIES Project in Milwaukee, Wisconsin

PPG recently completed a COLORFUL COMMUNITIES project in Milwaukee, Wisconsin that helped revitalize the Grand Avenue Club. The Colorful Communities program provides PPG volunteers and products along with financial contributions to bring color and vitality to communities where the company operates around the world, such as in nearby Oak Creek, Wisconsin, where PPG has an industrial coatings facility.

The project brought together more than 20 PPG and Grand Avenue Club volunteers, who spent approximately 15 hours revitalizing the club's library. PPG provided five gallons of PPG PAINTS products and painting supplies. Representatives from IUPAT-DC7 (International Union Painters Allied Trades) assisted with the project.

The Grand Avenue Club provides prevocational, employment, educational, housing, recreational and cultural opportunities to adults who have experienced mental illness so that their lives will be more productive and satisfying. The nonprofit serves 425 people annually throughout Southeast Wisconsin and is open 365 days a year.

PPG and club volunteers painted the library's walls and trim in a color palette of PPG Paints Nutmeg Glow, Pumpkin Cream and Siesta Dreams to create a welcoming and calming space for staff and clients.

"My leadership team and I were extremely pleased to support this project and are grateful to the volunteers who helped make it possible," said John Kovaleski, PPG plant manager, Oak Creek. "PPG and our employees are committed to giving back to the community by supporting important nonprofit organizations like the Grand Avenue Club."

Axalta Adds Digital Colour Management in EMEA

Axalta said it is redefining what is possible for car repair body shops of all sizes by helping them increase their efficiency through digital technology.

Axalta's Digital Colour Management uses a cloud-based color management system that enables body shops to handle the entire color retrieval and color mixing processes not only completely digitally, but also 100 percent wirelessly – something that is unique to Axalta, and a first for the industry.

Instead of matching colors by eye, with Axalta's Digital Colour Management refinishers simply take color readings of a vehicle's paintwork using Axalta's digital spectrophotometers, which wirelessly send the readings to Axalta's constantly-updated online global color database.

The best match can be selected on a smartphone or a tablet and sent via Wi-Fi to an IP scale for mixing the color formula. Labels and other print-outs can be handled wirelessly as well. A PC can still be used in the mixing room, but it is not required anymore. And thanks to the wireless data exchange between connectable devices, everything can be accessed by everyone in the same body shop network. There are also other online functionalities like stock management, paint shop management and e-ordering, as well as the ability to connect with many other digital management systems used in the body shop.

"Axalta's Digital Colour Management is the pinnacle of our digital services that help body shops be more accurate, more efficient and more profitable," said Adrien Schrobiltgen, VP for Axalta's refinish business in the E "And the premise is simple; the whole color management process is carried out with our digital and wireless technologies using only a smartphone or a tablet. Color chips, cables and PCs are a thing of the past."

In early 2018, Axalta marked the sale of more than 50,000 spectrophotometers globally.

"We are delighted that Axalta is the only company to provide the option to carry out the entire process digitally and wirelessly," Schrobiltgen said. "We are giving our refinishers the right tools to place them at the cutting edge of digital transformation that's happening in the refinish industry today, which in turn will help them achieve a solid competitive edge."

Sherwin-Williams Wins SSPC Military Coatings Project Award

Sherwin-Williams Protective & Marine Coatings, together with the U.S. Navy and Mid-Atlantic Coatings, Inc., earned the SSPC Military Coatings Project Award of Excellence for their work on the USS George Washington (CVN-73) supercarrier.

For the second time in five years, Sherwin-Williams stood up to the task of overhauling a thousand-foot U.S. Navy aircraft carrier to ensure leading-edge performance. Using new coatings and technologies, innovative collaborations and environmentally sustainable solutions, the USS George Washington had a range of critical areas preserved and recoated, from topside to ballast tanks and interior fuel tanks.

This year's honorees will be recognized Feb.11, 2019, at the SSPC Coatings+ Conference in Orlando, Florida.

Sherwin-Williams is a principal supplier of marine and MIL-SPEC coatings to the U.S. Navy and previously won this award in 2014 for a similar project involving the Navy's USS Ronald Reagan (CVN-76) supercarrier.

"From the beginning, we knew this project would require looking beyond the usual horizons – not just in terms of engineering a strategy, but in effectively communicating our innovations and ideas, and collaborating with the right teams," said Mark Schultz, government marine manager for Sherwin-Williams Protective & Marine Coatings. "Since several aspects of

the project were ground-breaking, not only were we challenged to assemble this complex arrangement of features and benefits, we also had to demonstrate how these technologies and teams would come together to deliver on our promise."

The coating project was part of the USS George Washington's multi-year midlife refueling and complex overhaul at the Huntington Ingalls Industries shipyard in Newport News, Virginia. This undertaking included preserving and coating the freeboard, main deck, topside and more than 100 interior tanks, along with prepping and maintaining the underwater hull surface. While the coatings project commenced in August 2017, development began more than two years earlier – reflecting the time and effort required to engineer and demonstrate new technologies, as well as new uses of existing coatings.

"In the past, we've typically used a two-coat system on freeboards, but we enhanced efficiency by using Sherwin-Williams Fast Clad ER, a single-coat solution, on about 70 percent of the freeboard instead," Schultz said. "This was a first, and there was no sacrifice to durability. The product's four-hour cure time allowed us to accelerate coating schedules, while also eliminating the possibility of missing recoat windows – a problem that can lead to delamination issues."

The project used Sherwin Williams SeaGuard 5000HS Epoxy for the remaining 30 percent of the freeboard, with Sherwin-Williams Polysiloxane XLE-80 HAPS Free Epoxy Siloxane applied as a top coat on the entire area. The Polysiloxane XLE-80 coating included a newly designed and approved Naval Research Lab low solar absorption pigment package. This formulation enhances the paint's signature "Navy Gray" color stability and reduces the solar temperature load on the vessel.

Within the ship, more than 100 tanks designed to hold ballast, chemicals, fuel, water, and waste were also coated with Fast Clad ER, which offers long-term immersion service for up to 15 years. The coating marks another advancement for use on seafaring vessels.

"The benefits of high solids coatings are coming to fruition," Schultz said. "We started with 98 percent solids Dura-Plate tank coatings more than a decade ago, and we're seeing those tanks hold up very well during inspections with no required rework. We'll see even more success down the road when they re-inspect tanks featuring Fast Clad ER."

Teams applied the coatings using plural-component sprayers and – in another innovative move – utilized cartridge technology from V.O. Baker Company developed for plural-component materials. Cartridges provide precise measurements for dispensing, which helps reduce the chance of mixing errors and allows teams to work longer. More than 95 percent of the touchup and repair work following the initial spray application was completed exclusively with cartridges.

Another new technology played a role in the project's surface preparation. Sherwin-Williams worked with Greener Blast Technologies and introduced the Naval contractors to vapor blasting, which uses a water-like medium to reduce dust levels during surface prep. This technique was used as the first blast to remove exterior built-up materials, such as biofouling and the outermost coatings before the secondary direct-to-steel blasting. Impressed by the process, the Navy created a new SSPC/NACE specification for vapor blasting.

Vapor blasting was another part of the team's efforts to find innovative ways to reduce the environmental impacts of the surface preparation work. Traditional sandblasting on an aircraft carrier creates massive amounts of waste and dust requiring containment and significant time-consuming clean-up; whereas vapor blasting cuts down on both while providing a similar blast profile. In addition, the contractor was able to complete the second blasting stage – abrasive blasting – more quickly and with far less debris due to the first round of vapor blasting.

Utilizing a vapor blasting process also produced additional advantages for the coatings' project. Working with water-powered pressure washers instead of gas-powered washers decreased fuel emissions, and the abrasive blasting process used recycled steel grit in the tanks. Additionally, slurry from the vapor blasting could be cleaned and recycled – further reducing waste.

"We always aim to take steps that improve sustainability and reduce

environmental impact, especially on projects of this scope," Schultz said. "The results across the board couldn't have been achieved without the intense cooperation of our dedicated teams and partners, or the support of the Navy when we suggested new solutions for the future."

Axalta, Plenham Form Three-Year Global Parternship

Axalta and Plenham Ltd, the parent company of bodyshop and IBIS Worldwide brands, jointly announced a multi-year global partnership to help the worldwide collision repair industry share ideas for business improvement, drive best practices in innovation, and establish new processes and know-how through dynamic media and social interactions.

"Having forged a strong bond over the last year it's clear we have a joint passion for improving the collision industry based on shared ethics and beliefs in 'doing the right thing.' This makes for an incredibly exciting 2019 and having Axalta right by our side enables us to deliver an unrivaled portfolio of events and publications," Plenham CEO Jason Moseley said.

"I am confident that this new alliance between Plenham and Axalta will significantly benefit our customers and the overall global collision repair industry," added Jim Muse, Axalta's VP of global refinish sales. "Axalta's long and successful track record in helping our customers enhance efficiency by using new products and technologies combined with Plenham's extensive network of body shops around the world make this a powerful combination. Together, we can advance new thinking and technologies quicker and get faster feedback on ideas that will make our industry better and more cost-effective than ever before."

PPG Awards 200+ Scholarships at 11 Chinese Universities

PPG recently granted in excess of RMB 750,000 ($110,000) in scholarships and science and technology innovation funds to more than 200 students from 11 Chinese universities as a part of its 2018 PPG University Talent Power Program. The company also expanded its career counseling services to 15 universities in 2018.

In partnership with nonprofit Give2Asia, PPG established the China scholarship program in 2003 to recognize students who are majoring in chemistry and material-related disciplines and performing at top levels in both academic and practical areas. The number of students receiving scholarships in 2018 nearly doubled from the previous year. ***CW***

White Tops Axalta's 2018 Automotive Color Popularity Report

Axalta released its 66th annual Global Automotive Color Popularity Report which shows white as the global leader in consumer vehicle color choice in 2018. At 38 percent, white held its top spot ahead of second-place black (18 percent) and a third-place tie between silver and gray (12 percent).

Regionally, black and gray saw significant increases in notable areas. Black jumped in China (five percent), Asia (three percent), South Korea and Africa (both two percent). Gray gained ground in Africa (three percent) and Europe (two percent).

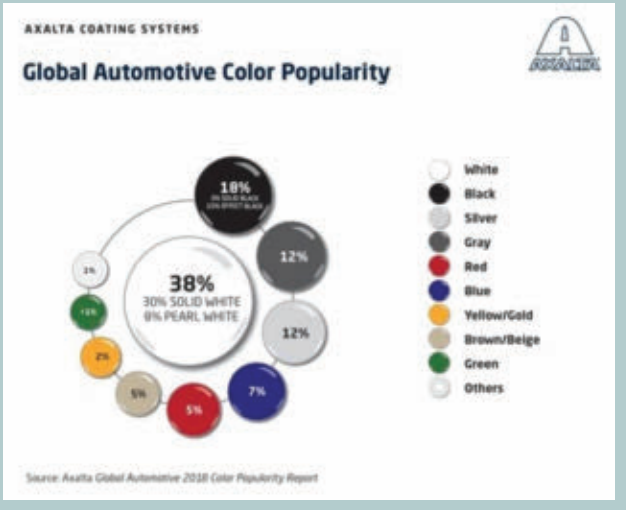
"We have witnessed an emerging trend toward warmer shades along with color combinations with black to challenge white's position," said Nancy Lockhart, Axalta global color marketing manager. "Although neutral spaces are the headliners, there is an indication of a return to color to change the automotive landscape. Blue is most popular outside the neutrals and holding strong at seven percent of the market, increases of orange and bronze are popping up and gaining interest."

Regional highlights from the 2018 report include:

- Asia: Even with a one percent drop, yellow/gold is most popular worldwide in India and China. Blue is being reimagined in Japan as ecological friendly shade. In Korea, black increased two percent;
- Europe: Europe is experiencing an upward trend of gray with a two percent increase;
- North America: Brown/beige experienced a two percent year-over-year increase; that is the biggest gain for any region;
- Russia: The most popular region for brown/beige at nine percent, Russia is followed by China at seven percent;
- South America: Red decreased one point to eight percent making this region second only to North America (nine percent);
- South Africa: Orange shows an increase from 2017, and 3.6 percent of all vehicles fall into the "Others" category.

"In China, white may have peaked in 2017 at 62 percent," said Annie You, Axalta OEM color designer – China, Axalta "This year, it is 58 percent, still well above any other region."

"For the first time in the history of our reporting, gray ranks second in the region making it a major player in the neutrals space," said Elke Dirks, Axalta OEM color designer – EMEA.



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PTFE Market Size to Increase at CAGR of 5.2% from 2018-2025: GVR

According to a study from Grand View Research, the global polytetrafluoroethylene market size was valued at $2.87 billion in 2017 and is anticipated to progress at a CAGR of 5.2 percent from 2018 to 2025. Increasing demand from various application industries, especially electrical and electronics sector, is expected to drive the PTFE market.

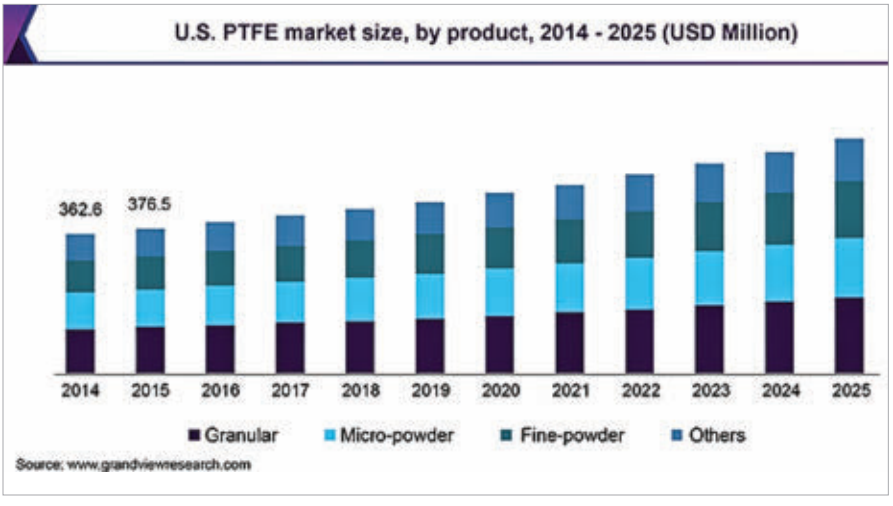
PTFE is an important fluoropolymer, accounting for a significant chunk of the global market. It is a flexible, non-resilient, and robust material with excellent chemical resistance and thermal properties. It is also an excellent insulator over a wide range of frequency and temperatures.

The product finds numerous applications in different industries including automotive and transportation and chemical processing due to its properties, such as chemical inertness, superior electric insulation, heat and weather resistance and low coefficient of friction.

Commercially, PTFE is made by two predominant processes namely granular polymer and dispersion of a polymer of much lower molecular weight and finer particle size. The other methods used for the manufacturing are decomposition of tetrafluoroethene (TFE) under the influence of an electric arc and polymerization carried out by emulsion method with the help of peroxide initiators, such as hydrogen peroxide ($H2O_2$).

Vessels, mixer shafts, dewars, laboratory equipment, fuel cells, pump components, pipework, control/monitoring instrumentation, and thermowells are some of the major chemical processing PTFE applications. The product demand is expected to witness a significant rise owing to the robust expansion of the chemical industry, such as growth in several chemical production sectors including specialty chemicals, agrochemicals, petrochemicals, and fertilizers. On the other hand, high costs associated with PTFE may hinder the market growth over the forecast period. Increasing raw material prices for fillers, pigments, and fluoropolymer resins along with global demand for premium-grade products have led to the high costs of PTFE in the past few years.

However, global product demand is projected to exceed the supply, particularly due to novel applications, thereby propelling market growth. The global industry is concentrated in nature with prominent industry participants accounting for a majority of its share. Companies are trying to reduce production costs, improve supply chain dynamics, and develop high-quality products by investing in R&D. High operational and maintenance costs associated with PTFE resin plants are keeping the threat of new entrants to a minimum.



Granular PTFE is ideal for molding several products and stock shapes, such as sheets, tubes, and rods. Granular products segment led the global PTFE market and is expected to continue its dominance in the forecast period. Such products are available in chemically-modified grades.

Among other products, the fine PTFE powder segment is expected to witness significant growth in demand over the coming years. Fine-powder products are processed by mixing them with hydrocarbon liquid to facilitate extrusion as a best. Generally fine-powders, through paste extrusion followed by post extrusion heating, are converted into usable products such as tapes, shapes and wire insulation.

Industrial and chemical processing was the largest application segment in 2017 and will continue its dominance over the forecast period.

Industrial processing applications include linings, gaskets, washers, seals, pump interiors, and spacers. The PTFE coatings in the chemical processing industry offer enhanced protection against harsh substances. Automotive and transportation industry plays a key role in the market growth in Asia Pacific.

These automotive and transportation applications include lithium-ion battery packs, body exterior, chassis and braking systems, interior, HVAC, paint masking, NVH control and heat shielding.

A large number of new vehicle manufacturing facilities in the emerging markets of India, China and Japan are boosting the growth of the global lightweight automotive materials. Asia Pacific accounted for the largest market share in 2017 and is projected to continue the trend over the forecast period. It is also one of the fastest-growing regions. On the other hand, North America and Europe, one of the mature industries for electronics, led to continuous technological advancements for end products. This factor is projected to increase the demand for PTFE in North America and Europe over the forecast period. ***CW***

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PPG Introduces PPG SPECTRACRON 385 Polyurethane Primer

PPG introduced its two-component PPG SPECTRACRON 385 POLY-IOTHANE high solids primer, which is formulated to provide outstanding durability in severe and corrosive environments.

With an unlimited recoat window, the polyurethane primer is designed for operations that require fast topcoat times. Its wet-on-wet capabilities increase shop throughput when paired with a PPG Spectracron two-component polyurethane enamel, with which it shares a hardener.

Photo courtesy of PPG

Tint capable and available in white and gray, PPG Spectracron 385 Poly-Iothaneprimer has excellent flexibility, chemical resistance, and direct and indirect impact resistance. It has maximum VOC emissions of 3.5 pounds per gallon.

The primer is suitable for industrial equipment, material handling equipment, building materials, telecommunications and heavy-duty equipment applications.

IFS Coatings Launches IFS Puroplaz Thermoplastic Powder Coatings

IFS Coatings launched IFS Puroplaz, a range of thermoplastic powder coatings.

IFS Puroplaz thermoplastic powder coatings are formulated to deliver a tough, functional, protective and beautiful film for a wide range of applications. The IFS Puroplaz product family includes Puroplaz PE, a polyethylene-based powder that delivers incredible adhesion and flexibility, and Puroplaz PA, a nylon-based coating that is tough yet extremely smooth.

IFS Puroplaz powder coatings deliver supreme technical performance providing incredible corrosion protection and excellent chemical and chip resistance as well as exceptional weathering and UV performance as well as first-rate cold weather performance.

IFS Puroplaz thermoplastic powder coatings have been carefully formulated to deliver great transfer efficiency and easy application for all application methods, including electrostatic spray and fluidized bed, and are perfectly suited to a wide range of applications including desert sand, marine and coastal environments.

"Through outstanding chemistry, IFS Puroplaz products provide unparalleled performance, and as unparalleled service is at the heart of IFS Coatings, we understand flexibility is key for many of our customers," said Tim Brinner, VP of thermoplastics at IFS Coatings. "As such, instead of limiting ourselves to nine standard colors, we are also able to offer custom color matching capability and flexible batch sizes."

Hempel Launches Coating Solution for 60-Minute Fire Protection

Hempel launched its new passive fire protection coating. Hempafire Pro 315 is currently available in Europe. Hempafire Pro 315 has been developed to maintain the stability of steel structures in the event of a fire.

This adaptable new product requires exceptionally low loadings and is fast-drying. Hempafire Pro 315 has been optimized for 60 minutes of cellulosic fire protection and provides some additional protection for up to 90 minutes.

Hempafire Pro 315 can be used for all steel profile types – from thin hollow tubes to large open columns and beams. This simplifies the specification process and reduces stock and operational costs.

"Hempafire Pro 315 is quick and easy to apply to offer significant efficiencies to applicators as well – whether in shop or on-site. Due to its lower loadings and thinner film thicknesses, Hempafire Pro 315 significantly reduces drying times improving paint shop efficiency," said Roger Soler, Hempel's group product manager, Cellulosic PFP.

"As a high-build coating, Hempafire Pro 315 can also be applied up to 1,600 microns in one coat, which means almost all steel sections can be covered with just one layer of intumescent coating. For on-site new-build application and repair, this gives you spray-and-go efficiency – and quicker project completion times."

PPG Introduces PPG SIGMASHIELD 880 High-Performance Coating for Extreme Offshore Environments

PPG introduced PPG SIGMASHIELD 880 high-performance coating to the U.S. and Canadian offshore market. The ultra-durable coating for vessels and rigs provides one-coat, direct-to-metal protection with quick curing at very high moisture levels, including underwater.

PPG SIGMASHIELD 880 offers superior abrasion, impact, seawater and corrosion resistance with improved cathodic disbondment protection and excellent resistance to chemical splashes and spills. Its shorter dry-to-touch means assets can be returned to service more quickly, with the coating continuing to cure upon immersion in water.

"Today's offshore marine and energy assets, whether they are oil and gas rigs, wind farms or the vessels that serve them, demand the very highest levels of corrosion protection in extreme operating environments," said Al Kaminsky, PPG marine manager, protective and marine coatings, U.S. and Canada. "PPG SIGMASHIELD 880 multipurpose, surface-tolerant epoxy delivers on PPG's commitment to helping owners manage application and maintenance costs." ***CW***

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Brand Value- Considerations for Coating Formulators and Additive Supplies

by Gary Shawhan and Phil Phillips, PhD
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phillips@chemarkconsulting.net

Brand identity and brand strength are important components in establishing and sustaining the value of a company's products or services. This applies to companies that participate at all levels of the supply chain including raw material manufacturers, additive suppliers, formulators and manufacturers of finished goods.

Within the coatings market, individual companies (at various positions in the supply chain) differ in the market segments they serve, the products, technologies or services they offer and the geographies they cover. Regardless of a company's business profile, creating strong and sustainable value propositions for the company's products/or services is a critical element in achieving and sustaining revenue growth and long-term profitability.

Effective branding is an important element in a company's business strategy as it supports a strong value proposition which is sustainable over time. Brand identity and strength elevate a company's competitive position in the marketplace.

Support for brand strength does require an investment commitment by management to garner this value and lengthen its life. Creating and then protecting value in products and/or services, however, is a shared responsibility within any organization (whether large or small). Its success is driven by the overall company culture and dependent on a commitment from individual employees through all levels of the organization.

Branding, as a means of creating and sustaining value, can be used as a tactic addressing specific market segments. Branding can also be directed at specific product lines or incorporated into the company's overall business philosophy. Within the coatings market, branding is a very important strategy for both additive suppliers and formulators (Figure 1).

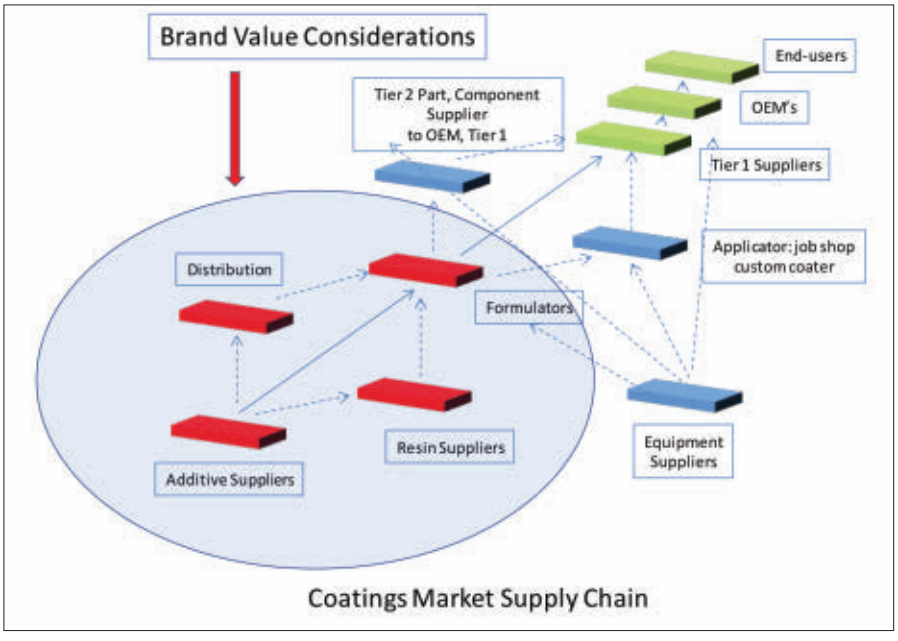

Figure 1: Coating Market Supply Chain

Brand identity provides formulators differentiation among their competitors. It can offer value protection at specific customers or within certain markets where product approvals are required or supplier QPL's are involved. Formulated coatings, which have identifiable performance features and benefits that stand-out from competitors, clearly have the potential to deliver sustainable value when supported by a strong branding strategy. Certain markets, however, only require a minimum level of final coating performance or are ones that have matured into a commodity market situation. These markets are also easily accessed by many suppliers with similar products. As a consequence, there is typically very limited space forward in the value chain that will support a value-added proposition or brand strength as a differentiator.

Stepping down in the supply chain, additives suppliers face different challenges in value creation and reinforcement. Trade names and branding strategies become a critical part of the go-to-market strategies for these suppliers. Additives (contained in coating formulations) identified by brand name and product nomenclature normally retain their value longer. Brand identity often complicates both market entry efforts and the subsequent approval process for alternative products from prospective suppliers. Brand strengthening and reinforcement through incremental improvements (for a given additive) that do not necessarily require a full requalification can lengthen and protect market value.

The value of branding is maximized when extensive laboratory testing along with field testing of the finished formulations are required. The time and resources needed to approve an alternative

source of supply become difficult to justify. End-use applications, which have stringent long-term coating performance requirements, often tied to warranties, add to the reluctance of formulators to submit modified formulations to their customers for existing specification business. Equipment manufacturers need a compelling reason to consider approving an alternative source of supply since such changes can carry liabilities when field failures occur.

Distribution, as a channel-to-market, plays a very important role for additive manufacturers supplying to coating formulators. Brand strength coupled with breath in the end-use market-reach associated with a given additive product line or product portfolio is extremely important and carries with it a high value in distribution. A strong brand represents leverage for additive suppliers when competing for a position with the best distributors as one of their principles. Distributors, in fact, compete with each other in order to represent the strongest brands in each additive category.

Mergers and acquisitions, within the paint and coatings market, have erased or diminished a number of recognizable brands that carried with them significant commercial value. These brand values were frequently ones built-up over many years and represented a level of quality and performance which differentiated them from other competitors. This brand identity also stretched across multiple levels of the supply chain. Company's contemplating or involved in M&A activities today have too often lost sight of these values in the rush to incorporate these added products or services into their own business. Customers have been lost and the expected market gains have sometimes been compromised as competitors capitalize on the situation. Company's active or contemplating M&A activities should consider the values the exist in the brands they are acquiring and find ways to retain this value as part of this process. **CW**

The Chemark Consulting Group provides general management consulting services for coatings, paints, adhesives, resins, polymers, sealants, additives and specialty chemicals. The company has 35 years of experience servicing clients in the transportation, automotive, appliance, flooring, aerospace, textile, DIY, general industrial and specialty chemicals industries. CHEMARK provides for strategic planning, M&A and implementation protocols from small to mid-cap companies to divisions of large-global organizations. CHEMARK is global and serves its global client base which includes product formulators, raw material suppliers and application equipment producers, with 41 managers and associates.

New Dow Andes Regional Head in Bogotá

by Charles W. Thurston
Latin America Correspondent
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DowDuPont appointed Charly Eid as the new head of the Andes region for paint and coatings at a time when fostering growth there is a challenge. Colombia is the promising economic center of the region and Peru is a standout, while both Bolivia and Ecuador are lower growth prospects, and Venezuela's market is in a shambles.

Based in Bogotá, Eid's title is commercial director of the Latin American Performance and Performance Monomers business and Dow president in the Andean Region. His mandate is the development of business strategies and the creation of initiatives for generating value and financial results. Apart from a long history at Dow and other companies, he launched his own marketing firm focuses on non-traditional approaches, which may be a crucial tool in creating value for Dow.

The economic prowess of the Andean nations varies substantially, and exports are a key factor in the equation. Over the first three quarters of 2018, regional exports were up by around 10 percent over the year-earlier period, led by export growth in Ecuador at 16 percent, and both Colombia and Bolivia at 14, according to a December report by the United Nation's Economic Commission for Latin America and the Caribbean (ECLAC).

Colombia presents a strong case for lifting the Andean region, with projected growth of 4.8 percent over the coming decade, according to a recent report by ratings agency Fitch. While ECLAC projects a lower number, it does expect GDP to rise by one percent per year. Such growth is translating into a larger middle class, which is expected to represent over a third of the population by 2020.

The decreasing inflation rate in Colombia will empower this rising middle class. Over the past four years, consumer inflation has dropped from 6.8 percent to 3.3 percent, ECLAC reports. At the same time, Colombia's Central Bank has eased interest rates to encourage spending.

Colombia's workforce also is expanding with the entrance of Venezuelan ex-pats. Some 45,000 people cross the border from Venezuela into Colombia daily, seeking to earn a living and access to goods and services that are difficult to find in Venezuela, Reuters reports. Colombia already hosts some 1.2 million Venezuelan migrants and Bogotá is the primary destination of the economic refugees, the agency estimates.

The World Bank recently analyzed the Venezuela-Colombia dynamic and found that for every half a million people of working age that migrate from Venezuela to Colombia, the economic growth in Colombia could accelerate by 0.2 percentage points per year.

In a separate study on Colombia, the World Bank found that only 38 percent of adults over the age of 15 have a bank account, while 100 percent have a cell phone. Extending the challenge of reaching such a consumer class, ECLAC reports that 48.3 percent of those employed in Colombia work in the undocumented informal economy. These statistics point to a strong mobile marketing opportunity for Dow and other paint manufacturers in the region.

Dow faces substantial competition in Colombia from domestic paint companies like Grupo Orbis, which has begun the development of a domestic chain of Do-it-Yourself stores named Master Pro that will feature subsidiary Pintuco's full line of paints and coatings. ***CW***

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R&D in EU Focuses on Climate Change Issues

Climate change is at the moment setting the R&D priorities for many European producers of coatings and their raw material suppliers.

by Sean Milmo
European Correspondent
milmocw@rodmanmedia.com

Climate change is at the moment setting the R&D priorities for many European producers of coatings and their raw material suppliers.

Their objective is to find ways to use new and existing technologies to reduce the carbon footprint throughout a product's lifecycle from its raw materials stage to manufacture, application and use through to recycling or disposal.

This can provide options to customers like switching to waterborne or high solids coatings. Or they can provide coatings materials with a low level of volatile organic compounds (VOCs), possibly achieved through the development of biomaterials with a quality and performance equal or perhaps even surpassing those derived from petrochemicals.

Another alternative route is the development of CO_2 into coatings raw materials. Instead of being emitted into atmosphere CO_2 becomes part of a closed loop as a raw material for a product which at the end of its life cycle is broken down and reused as a material in another product.

But the more technologically advanced the option the bigger the obstacles which may stem from basic science and physics but can also be a matter of economics and government policies.

Being Europe's largest coatings market, Germany is one of the region's leading producers of coatings and their raw materials. With the help of R&D funds from its federal government it is also a leader in the development and commercialization of low carbon coatings technologies. As a result it is fully aware of the technological difficulties.

As one of the biggest producers in both

Germany and Europe of both coatings and their raw materials, BASF is also among the most active in the development of chemistry which is helping to produce new materials with low carbon footprints, including materials based on CO_2.

BASF has a strategy of cutting CO_2 emissions through greater energy efficiencies in its own production processes through the use of low-carbon raw materials, such as biochemicals. This in turn helps reduce carbon footprint through the coatings and other supply chains by helping customers meet their own sustainability targets.

"For ourselves and our customers improving the sustainability balance is the biggest innovation driver," Martin Brudermueller, BASF chairman and chief technology officer, told the company's annual R&D press conference at Ludwigshafen, Germany, in January.

In addition to striving to find ways of reducing CO_2 emissions, the company is at the forefront of efforts to develop technologies for converting CO_2 into a feedstock or raw material, ultimately for coatings and other products.

Already BASF has reduced its greenhouse emissions by 50 percent since 1990 while doubling its output volumes. "Achieving another significant reduction in CO_2 emissions will require entirely new technologies," Brudermueller said. But developing CO_2 into raw materials was also a massive technological challenge.

The company has introduced energy saving innovations downstream such as a paint system for automobiles which controls the temperature of the coating through management of UV rays.

"A UV-reflecting primer reduces the temperature on the vehicle by up to 20C," explained Joerg Zumkley, global communications manager at BASF Coatings. "This results in less heat in the interior so that through energy saving with the air conditioner fuel consumption is reduced."

However, some of BASF's biggest initiatives on climate change have been upstream in the supply chain. It is now using bio-naphtha or biogas derived from organic waste or vegetable oils as a feedstock for ethylene crackers. Through a certification system, this enables downstream customers, such as manufacturers of coatings and other raw materials, to claim that their products are at least partially bio-based.

The most technologically ambitious technologies currently being developed by BASF is the conversion of CO_2 into upstream feedstocks which is helping to add to the sustainability balance of coatings and other supply chains. It is able to make these advances because it is a chemicals conglomerate backward integrated into the production of ethylene and propylene and other basic chemicals, as well as a specialist in catalysis.

Through the development of new catalyst systems it has created a technology for the dry reforming of methane for the production of syngas with a low CO_2 footprint. The syngas can then be converted through catalysis into dimethyl ether (DME) for production of olefins.

Nils Bottke, head of BASF's chemicals catalyst research, told the R&D conference, that the process which has yet to reach the commercialisation stage would improve process efficiency by 10-15 percent and reduce the CO_2 footprint by 50-70 percent.

BASF has also been involved in joint R&D projects with other German chemical companies on low-carbon coatings technologies, usually with the help of funds from the German government.

One of these has been the development of a bio-based hardener with Covestro, a specialist in polyurethane coatings materials which has been adopting a similar strategy of using biochemicals to reduce carbon footprints while also developing CO_2-based raw materials through university R&D partnerships.

The two companies, with the car manufacturer Audi, have combined to introduce an automobile clearcoat with a biobased hardener.

Covestro has since introduced its own variants of the technology to launch biobased hardeners for furniture coatings.

However the company's major technological advances have been with CO_2 based materials, particularly with bio-derived polyols for polyurethane coatings materials.

"CO_2 is gaining in importance as an alternative carbon source (since) CO_2 is virtually infinite and globally available," explained Daniel Koch, head of Covestro's site network in Germany's North Rhine-Westphalia, where it is developing CO_2 material technologies. "However using CO_2 is technically very challenging," he warned.

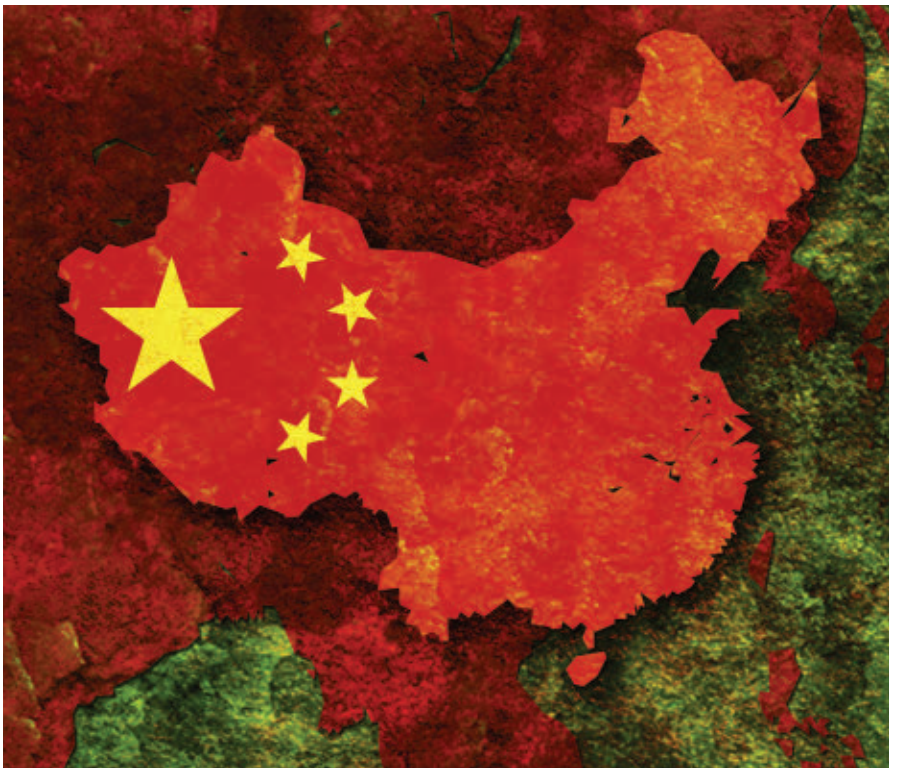
This was a view echoed by Brudermueller at the BASF R&D conference who pointed out the limits of decarbonisation and relying on CO_2 as a raw material.

"Chemistry is based on carbon and cannot be decarbonized," he said. "Using CO_2 as a substitute raw material is only an option in a limited number of cases. Carbon dioxide is a very stable molecule so that using it as a chemical raw material requires a very energy intensive process."

But he did pointed out that the costs of energy-intensive CO_2 conversion processes could be offset by the potential for 'negative pricing' of carbon dioxide under the European Union's trading system for carbon emission allowances when CO_2 is used as a raw material. This could make CO_2 as a raw material source a much more attractive proposition. ***CW***

Domestic Companies Reshape CHINACOAT 2018 Blueprint Structure

by Arnold Wang
China Correspondent



As predicted, many big-time international players – Dow Chemical, BASF, Eastman Chemical and others – were absent from CHINACOAT 2018.

But this most important coatings show in the Asia Pacific region was not short of new faces.

Visitors witnessed a markedly increased presence of domestic companies, although the growth of the whole coatings industry in China is slowing down.

International partnerships, new applications and cool technologies led the trend of product offering from coatings raw material companies in this show, along with oil to water trend which is still popular in China.

Business executives frequently used the word "regulations" and term "trade war" during interviews with *Coatings World*.

Uncertainty is a common sense in the manufacturing industry, to which coatings is no differeny.

Puhler has four plants in China, two of which are in Guangzhou. The company is focusing on developing waterborne industrial coatings and the automotive coatings market, both of which are enjoying fast growth because of environmental regulation changes in China.

Another important market for Puhler is the billboard market. Thirty percent of Puhler's sales are generated by its spray ink business unit.

Puhler doesn't fight market competition alone. It forged a close partnership with Italian company Uptech srl in the development of Morph DHM dry grinding system. Additionally, Puhler partnered with German Leimix Gmbh on developing and producing high-speed dispersion machines.

Puhler recently launched its iMo Smart mill system into the market. With the same driving platform, iMo Smart can be easily designed as four different mill machines, which each fitting specific customer demand.

Innovation and R&D are driving business growth of Puhler worldwide, and with the support and help of its partners, Puhler continuously launches new products to meet new market trends, the company reports.

Another company standing out at the show was Sunin. Hsu F Sheng, managing director, Sunin Machine Co., Ltd, told *Coatings World* in the company's booth that China's coatings industry faces pressures from environmental protection, trade war, labor issues, and more, which contributed to a common perception that the coatings industry has high risks and new investors are unwilling to take on new projects.

Instead of waiting for the situation to get better, Sunin is actively developing a new market segment based on customer demand. With 40 years of experience in the coatings industry, Sunin focuses on providing the best in class after sales service to their customers. The company recently launched sample painting machines designed specifically for lab use. This series has several models that can meet different customer demands.

Another new product launched by Sunin includes the AFD-5GAL packing machine, which combines several functions into one machine, saving space and requiring less manpower.

Pigment companies were widely seen in Guangzhou. Indian and Chinese pigment companies are catching lots of attention and as a result, European companies are feeling a lot of competition. With their booth stationed in the center of Hall 1, DayGlo, Swada and Radiant had a major presence at the show. Radiant is a leader in the development and production of fluorescent pigments. This Belgian company has unique products for both

the coatings and ink markets.

Jan Van Speybroeck, sales director, Radiant, said that the company's fluorescent pigments can be used in food contact products – something that differentiates Radiant from its competitors. At CHINACOAT 2018, Radiant showcased an array products that use its fluorescent pigments, including one adidas shoe that contains three pigment applications.

On the show's opening day – Dec. 4 in Guangzhou – Covestro demonstrated its numerous sustainability-inspired, eco-friendly innovative coating and adhesive solutions for a wide range of industries including automotive, construction, energy, furniture, sports and leisure.

"Sustainability is not only a mega trend for our era but also a key driver for Covestro to keep pushing the boundaries of innovation," said Zhong Xiaobin, senior vice president of Coatings, Adhesives and Specialties business unit at Covestro Asia Pacific. "In addition to improving the usability of adhesive technologies and low VOC coating technologies including waterborne technology through innovation, we are committed to working closely with partners across the industry value chain to promote sustainable development."

Covestro organized a wind power coatings press conference in the morning with its downstream partners including PPG, Goldwind and China National Building Materials Co., Ltd.

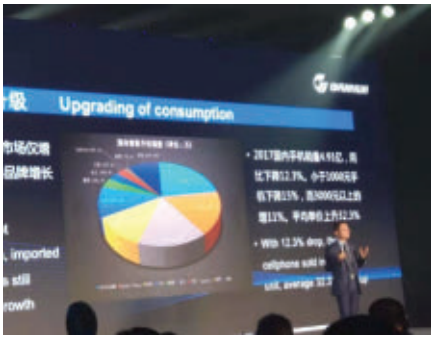
Ye Qingfeng, technical director, Asia Pacific Region, PPG, said PPG has been testing new coatings systems for wind turbine blades with its partners. As the speed of the tip of the blade is fast and the offshore environment is complicated.

Dr. Jorg Horakh, marketing and product manager, Heubach, told us that the compan's anti-corrosive coatings business is booming in China and Heubach is currently focusing on growing its business presence in this market segment.

In February 2018, Heubach began operating a new plant for anti-corrosive pigments in Pennsylvania. This new plant increases its global production capacity by about 4,000 tons per year.

In 2018 SAPICI launched several new materials for the waterborne coatings market in China, including Bluecryl, Hydrorene and Bluepur, respectively acrylic dispersions, polyisocyanates for waterborne systems, and PU dispersions. SAPICI entered the Chinese market 12 years ago and it now has a production plant in Zhuhai which has a capacity of 15K tons per year.

> "Visitors to CHINACOAT 2018 witnessed a markedly increased presence of domestic companies."



CHINACOAT 2018

The company is increasing its market presence in China by following the government's Go-to-West policy, according to Marco Meloni, global business manager, SAPICI. The company is also planning to increase its sales in north China, such as the area surrounding Beijing.

Wanhua Chemical has been partnering with SAPICI in developing the markets. With a great year for Wanhua's MDI business, Wanhua had the largest island in Guangzhou and held a splendid welcome dinner for its customers right before the show. As Wanhua disclosed, the labor cost in China is increasing quickly, and right now it is higher than those in Southeast Asia and Latin America, leading to value transfer and repositioning on industry chain. And upgrading of consumption offers new opportunities. For example, although the car market is slowing down, luxurious brands enjoy fast growth.

Pilot highlighted diphenyl oxide disulfonates, especially Califax16L-45 and Califax 6LA-70, in their booth.

Jan Zeinstra, GM, EMEA and Asia, Pilot Chemical Company, said that Pilot is offering unique surfactant chemicals in China to target coatings emulsion companies.

Several architecture emulsion companies have been partnering with Pilot already and as China's demand for high-quality coatings is growing Pilot is trying to expand its market share through their distribution system in China.

Orion specializes in developing and manufacturing carbon black.

In Guangzhou, Orion introduced its new Colour Black OE 430 W.

David Deters, senior vice president and chief technology officer, said that compared with traditional carbon black, OE 430W is very easy to be dispersed in the water and very suitable for automotive OEM coatings as well as other applications with a need for high-quality black color. With Colour Black OE 430, one does not need to add dispersant agents, saving cost, per Deters.

Marcus Mahn, global marketing director for Coatings, said that with 14 plants worldwide, Orion can easily move capacity and control inventories so as to address the impact from a trade war.

The company is also considering market expansion in Asia, especially in China.

Although the growth of China's coatings market is slowing down, both domestic and international companies are not losing faith in the local market.

Waterborne coatings are growing at two digits still, and UV and powder coatings are both growing fast.

China is upgrading its coatings an ink industries, which offer new opportunities to every company who can offer differentiated products and technologies at competitive prices. **CW**

Housing, Furniture Boom to Drive Kenya's Wood Coatings Market

There is growing optimism in the future performance of the wood coatings market as Kenya revives the stalled plans for the construction of two million housing units across the country's urban areas.

by Shem Oirere
Africa Correspondent

The future of Kenya's wood coatings market looks promising despite persistent challenges in the country's wood and wood products supply chain, which is characterized by increasing demand against a diminishing supply that could impact the overall demand for wood finishes in the East Africa country.

There is growing optimism in the future performance of the wood coatings market as Kenya revives the stalled plans for the construction of two million additional housing units across the country's urban areas with the first 500,000 housing units expected by 2022. The housing units are in addition to the increasing expansion of the country's education sector to accommodate the increasing student population, that could also trigger long-term demand for quality wood coatings in Kenya in the drive to improve wood products' aesthetic look, cushion them against environmental damage and also protect them from chemical attacks.

Although challenges such as the delay to construct the 500,000 housing units means slow down in demand for wood coatings, the housing sector is expected to be the key driver for wood protective chemicals in Kenya as the country strives to clear the backlog of nearly two million housing units, which is an equivalent of 61 percent of urban households living in slums in a country where the urbanization rate has grown to 4.2 percent.

An earlier report by the Kenya Property Developers Association estimates annual housing demand in the country to 200,000 compared to the average 50,000 units coming online every year.

Nevertheless, President Uhuru Kenyatta has

revived government plans of ensuring construction of 500,000 affordable and decent housing units by 2022 as part of his 'Big Four' agenda to meet the needs of the country's growing urban population. The surge in the construction of houses in Kenya is expected to trigger new demand for wood products that require different types of resins such as polyurethane, nitrocellulose, acrylics, unsaturated polyester.

Paint manufacturers in the country are optimistic the plans to build additional housing units across the country's urban areas will boost their business operations with some manufacturers affirming their readiness to meet the anticipated demand for quality paint products.

"The Kenyan government has indicated interest in providing one million low-cost houses and we expect that this will create a significant demand for paint," said Rakesh K. Rao, group chief executive officer of Crown Paints.

"We already have a range of economy paints and other products to meet this demand," he said. The company manufactures Crown wood finishes series such as aquavar varnish, multi-purpose clear varnish, oil varnish stains, polyurethane clear varnish, polyurethane wood seal, two-pack epoxy varnish and two-pack polyurethane varnish.

Furthermore, Kenya's furniture industry is growing and is expected to continue consuming substantial volumes of both interior and exterior wood coatings despite the challenge of huge deficits of wood products such as sawn timber and poles that the industry uses as feedstock.

At the moment, Kenya is East Africa's largest furniture market, estimated at $496 million, of the region's total market value of $1.2 billion, and has been growing at 10 percent annually in the last five years.

"Kenya is likely to take the lion's share of the market even though its urban population is smaller than that of Ethiopia and Tanzania," said a report by the Ministry of Industrialisation and Enterprise Development (MIED).

The report attributes the growth of Kenya's furniture market to increased urbanization, economic growth, growth in housing and office construction.

"Product segments that are forecast to see the most growth in sales are kitchen and bedroom furniture, wooden seats and other seats and parts," it added.

The projected growth is likely to build on lessons derived from the 2017 decline in furniture manufacturing when the industry registered a 4.4 percent drop compared to the 12 percent, 14.8 percent, 22.5 percent, 22.5 percent increase recorded in 2013, 2014, 2015 and 2016 respectively. The Kenya National Bureau of Statistics attributed the decline to "a drop in the production of mattresses which went down by 6.3 percent."

Elsewhere, the MIED report has identified various supply and policy constraints that could stifle the growth of Kenya's furniture market hence limit the demand for wood coatings. The constraints include the inability of the country's forestry sector to meet local demand for timber forcing the consumers of sawn timber to rely on imports from other East African countries.

"The import licenses for timber are nevertheless required but lack transparency and create opaqueness across the industry," it said.

"The sawmilling industry is fragmented and characterized by a lack of investment and the wood processing industry is also not operating optimally due to its oligopolistic structure, the protection it receives from import duties on equivalent products, and operational issues and inefficiencies," added the government report.

Apart from the industry-related challenges, Kenya's wood finishes manufacturers are also recovering from the disruptive 2017 year when political uncertainty led to a cash crisis that made the companies operations quite challenging.

Rao said 2017 "was one of the toughest years in the manufacturing industry due to the political environment that led to a slowdown in the economy."

"This led to a slow growth in the construction sector and a serious cash crunch in the market that slowed the payment cycle from all categories of customers leading to slow uptake of our products," he said.

Crown Paints said the increased cost of raw material by about 30 percent to 40 percent, made 2017 "a very difficult business year."

Other industry players that are eyeing a share of anticipated growth in wood coatings in Kenya include Basco Paints, Sadolin Paints, Robbialac Paints, Solai Paints and Nasib Industrial Products.

Going forward, growth of the Kenyan wood coatings market, just like the rest of Africa, would depend on the soundness of the coating manufacturers business and operational strategy that would enable them survive the global volatile raw material prices while keeping their products affordable and also effectively address the increasing concerns about Volatile organic compounds (VOCs) originating from the coatings industry. ***CW***

WOOD COATINGS MARKET

photo courtesy of PPG

Wood coatings are used in variety of industrial and residential applications and provide both aesthetic-appeal and durability.

Kerry Pianoforte, *Editor*

The wood coatings market encompasses both coatings for industrial applications such as cabinetry, furniture and flooring and DIY products for home products such as decks and remodeling projects. Wood coatings provide increased durability on woods and aesthetic properties.

One important factor impacting wood coatings is the housing market.

"The housing market is directly linked to the wood coatings market, which is why the housing market recovery had a strong effect on our market," said Anthony Woods, segment marketing director wood coatings, AkzoNobel.

"The growth drivers are based on new housing starts and home remodeling," Woods noted. "In addition, the shortage of contractor labor is driving an increased trend to in-factory finishing, especially in building products. Trends in architecture, home design and lifestyle are key drivers for our work in wood coatings. We continue to see a growing trend in open home design – a main influencing factor on how consumers choose complementary coatings to showcase how the rooms flow together. Does the flooring complement the furniture in a space, and do the kitchen cabinets marry well with the furniture that is chosen? Color and protection are key features that customers rely on, and they value our expertise in this area. We also see opportunities in bathrooms, where homeowners have enormous options to create on-trend bathroom looks, given the choices in vanities and flooring options."

Jim Lamont, senior marketing manager, wood care at PPG reported that economic indicators are favorable for the architectural coatings industry in the coming year with projections indicating that both housing and commercial construction will

grow in 2019. "We are seeing various factors drive growth in the coatings market, including a rise in existing home sales, new construction, employment rate and consumer confidence."

"The wood care market sales continue to increase year over year," said Jennifer Newell, brand manager at Rust-Oleum. "Boomers are downsizing from traditional five-bedroom family houses to updated three-bedroom homes or condos and finding their heirloom furniture and décor is no longer scaled to fit the new, sleekly designed contemporary environments. Their furniture and décor feel outdated and consumers are updating both. Millennials are driving their own trends as well, with social media being an influencer to their space. Environmentally friendly and repurposed/reclaimed furniture and décor trumps other considerations."

Meeting Customer Needs

Wood coatings manufacturers interviewed by *Coatings World* reported that their customers are looking for products that provide eye-appeal, durability and ease-of-use.

"Our customers have two key focus areas," said Woods. "First, the benefit to the end consumer, which means improved aesthetics as well as stain and scratch resistance; and second, the reduction in their total cost of ownership, which focuses on products that can remove process steps or costly labor steps as well as increasing their overall production capacity or reducing their costs.

"We identify color trends and translate them into relevant color palettes and products that meet our customers' expectations in every circumstance. Our coatings are designed to offer protection of your wooden home features to ensure the beauty lasts."

"Our wood care product lineup has a history of innovation and technology that delivers against the needs of professionals," said Lamont. "Customers continue to look for wood care products that are versatile, durable and easy to apply regardless of the climate. Olympic Elite Advanced Stain + Sealant in One, for instance, is engineered to protect and enhance the natural beauty of wood. Olympic Elite stain was developed for durability and incorporates high levels of protection against the damaging effects of sunlight and water while providing mildew and algae resistant coating. Semi-transparent and semi-solid stains are available in 14 wood-inspired colors, and 40 rich color options are available in the solid stain opacity."

Lamont noted that additional trends in terms of performance include products that are versatile and can perform on a variety of substrates and in various weather conditions. "A great example of a product like this is OLYMPIC MAXIMUM Stain + Sealant in One, which contains unique WEATHER-READY application technology."

Color Trends

AkzoNobel has a global team of experts dedicated to color. This team works with designers and architects around the world to understand the impact of fashion and lifestyle on colors used in paints and coatings.

"Our wood coatings business recently launched the results of our latest work on color trends for 2019: Sage grey, Chili red, Dijon yellow and Lapis blue. These colors were sweeping the runways in fashion shows all over the U.S. and Europe," said Woods. "The recent grey tones that have dominated paint colors recently are moving slightly into a more sage-based color that is crisp and neutral without being dull. The bright red and yellow colors give consumers a pop of color to delineate space on an accent wall or with a brightly colored appliance in a kitchen."

"Stain color trends vary by region, as consumers tend to coordinate their exterior wood substrates with the natural environment around them," said Dee Schlotter, PPG senior color marketing manager. " For example, we are seeing a mix of deep, earthy hues native to the Pacific Northwest merge with lighter hues seen along the California coastline, such as driftwood, sands, pale blondes and wheat tones. Warmer stain hues, such as honeyed bronzes and ginger browns are used more frequently throughout the Central U.S., and cooler tones such as smoky neutrals, light greys and trending black hues are more common on the East Coast and in states like Florida.

"Another trend that is gaining momentum with consumers is extending interior stain colors to exterior spaces such as a deck or patio. There is an increasing interest in minimalism and connectedness to nature in today's society and this seamless transition allows users to extend their indoor living space to the outdoors."

Color trends and availability continue to drive sales, Newell

AkzoNobel's latest Color Trends: Dijon yellow, Chili red, Lapis blue and Sage grey.

noted. "Time savings, and being able to complete projects in a weekend, or on just a Saturday," she said. "Lighter, gray-toned browns and light, natural neutrals are starting to trickle back into the market after years of darker browns. Grays and gray-toned browns continue to dominate the market. Whitewashed and distressed finishes continue to dominate the market and red and orange-based color tones continue to decline in sales.

New Products

AkzoNobel:

• PurTone Stain System - a revolutionary stain system that develops the natural tone of wood while simplifying the process - ideal for cabinets, furniture, millwork, and paneling.

The PurTone Stain System delivers the appearance of a complex and labor-intensive multi-step wipe stain finish in just two to three easy steps. By reducing the labor involved, the system shortens the time workers are exposed to finishing materials and enhances the final wood detail without adding complexity. It can be applied using existing manual or automatic processes and can be used under a variety of clear topcoat technologies. The PurTone™ Stain System provides clear, highly-defined grain and stunning depth of finish.

Benefits:

• Reduced finishing labor costs compared to wipe stain finishes;

AkzoNobel showcases one of its Color Trends: Dichotomy.

• Distinct aesthetics for higher consumer perception;

• Ease of application and uniform appearance for higher consumer perception;

• Multi-line application;

• Elimination of variability found in hand-wiping

• NaturaMatte - Natural finish, high-performance UV coatings for flooring

NaturaMatte UV coatings for flooring brings the popular Scandinavian, natural, low gloss look to North America in a high-performance finish. While most products in the market display higher gloss at low viewing angles, NaturaMatte coatings deliver a consistent matte appearance from any angle.

The superior abrasion resistance of this coating system greatly reduces scratches from daily wear and tear. In addition, this innovative chemistry provides excellent clarity without the milky haze commonly found in low-gloss products.

NaturaMatte coatings create an organic look with warm and natural aesthetics that highlight the wood character.

Benefits:

• Matte finish from all viewing angles;
• Superior scratch and abrasion resistance;
• Transparent finish with distinct and clear appearance;
• Warm, natural, organic look and feel;
• Excellent mar and stain resistance that exceeds industry standards;
• Suitable for all UV application lines with gloss control capability

PPG:

• OLYMPIC SmartGuard clear multi-surface sealer is PPG's latest innovation. The first-of-its-kind product in North America, Olympic SmartGuard offers a super-concentrated formula in a lightweight, easy-to-handle pouch package that covers as much as two-gallon cans. It seals wood, concrete, masonry and weathered composite*, penetrating the substrate to provide advanced durability and protection. It can be applied after rain or cleaning and dries in one hour, as compared to 24-48 hours for traditional products. *Sealing may void some composite manufacturer's warranties. It is formulated to be extremely fast and easy to apply, especially from a pump sprayer, but applies easily with brush or roller as well. Olympic SmartGuard is available at select U.S. Home Depot stores and premium authorized dealers.

Rust-Oleum:

• Varathane Classic, a line of traditional wood stains that allow the user to build coats to customize their richness of color;
• Charred Wood Accelerator, a finish that mimics the look of a burnt wood finish (without the torch!);
• Next Generation Gel Stain, an updated Gel Stain formula that boasts better durability, one coat coverage, and a two-hour dry time. ***CW***

CORROSION CONTROL

Coatings World interviewed a number of major coatings manufacturers on the topic of corrosion control. The respondents were Viktoria Slattery, technical lead packaging coatings product development, AkzoNobel; Peter Guest, group technical manager, EMEA liquid industrial coatings, Axalta Coating Systems; Robert Wong, group director, head of protective & industrial, Hempel A/S; Steven C Matthews, technical sales & operations manager – Americas, PPG Protective and Marine Coatings; Dr. Jeffrey David Rogozinski, global product director and Bruce Towes, global market director – oil and gas for Sherwin-Williams Protective & Marine Coatings.

Kerry Pianoforte, *Editor*

Coatings World: Protecting a substrate from corrosion is one of the most important functions of coatings. What types of products does your company recommend to protect high value assets (pipelines, outdoor structures, oil rigs, etc.) from corrosion?

AkzoNobel: The particular product will always depend on the specific end use, but some examples include high film build coatings based on epoxy technology or multi-coat systems including an anti-corrosive pigment containing primer combined with a functional top coat. At AkzoNobel we believe in sustainable coatings and through decades of real life case studies have successfully proven that chrome free primers can perform equally when compared to carcinogenic chrome VI containing primers, dependent on the environment the product is exposed in.

Axalta: Coatings need to be considered as 'barriers' applied to assets to extend their working lives. A secondary application, certainly in heavy duty protection, is to provide an acceptable finish. Selecting coating products and systems are specific to each asset and are dependent on a number of factors, including construction material, method of preparation, working environment, life expectancy, asset value, budget for protection, appearance required, application process, VOC limits, and so on. Appropriate coating products can then be selected, usually a range of product options which will offer different positive and negative impacts. We offer a wide variety of ecoat, liquid, and powder coating products, which can be used in combination to fulfill all requirements for coaters. From the industry leading heavy-metal-free ecoat (EC6100) to zinc-free or zinc-rich primer systems in liquid and powder coatings, to high solids topcoats, we have a product system to meet any customer requirement.

Hempel: Protecting any asset, high value or not, against corrosion involves selecting the appropriate system from the outset which usually consists of two or three coats of paint. The first coat normally involves a zinc silicate or zinc epoxy-based primer, followed by a high build epoxy mastic intermediate coat (for added barrier protection) and completed with a polyurethane cosmetic top coat. If a higher performance top coat is required, then a polysiloxane based coating should be selected.

PPG: Multi-coat highly advanced technological solutions like zinc-rich epoxy primers, high-solids epoxies and polysiloxane topcoat technologies (should be considered).

Sherwin-Williams: In the oil and gas pipeline market, a multi-layered coatings approach is advised to prevent pipeline corrosion, protect anti-corrosion coatings and preserve fusion-bonded epoxy (FBE) coatings before pipes are buried in the ground. For example, the ideal base coating layer is an anti-corrosion FBE coating designed to prevent corrosive

elements from reaching the steel pipe substrate and working synergistically with cathodic protection systems. Next, a protective, abrasion- and damage resistant FBE coating layer is advised to resist the scratches and scrapes a pipe may encounter from transportation to installation. Such scrapes could otherwise expose the bare steel below and increase corrosion potential. Finally, it's helpful to consider a preservation layer as an optional topcoat to protect the lower FBE layers against prolonged UV exposure in oftentimes inevitable cases of pipeline installation delays. When building this sort of pipeline protection one layer at a time, remember that all three coating layers will work synergistically and should be selected based on the most stringent performance needs to ensure success.

CW: What are the main factors to consdier when selecting a corrosion protection coating?

AkzoNobel: When selecting the right coating to protect your assets, for instance a metal roof or a metal garage door, it is very important to understand the environment your asset is exposed to. The corrosion severity in rural areas is lower compared to industrial and coastal areas due to variance in factors such as temperature, humidity and salinity in the air. When we evaluate corrosion performance we always test "fit for purpose" through appropriate accelerated and natural corrosion tests, for example prohesion or seaside exposure. We use exposure sites around the world and compare the behavior of our products in various environments.

Axalta: The asset and its environment, substrate and pretreatment, life expectancy requirement, finish expectations, ease of coating application, environmental requirements and budget.

Hempel: There are three main key considerations: the aggressiveness of the environment – industrial, coastal and marine environments being the harshest and most challenging; durability – what is the expected lifetime of the coating system required and in-service performance requirements – for example high heat; fire protection; chemical resistance; maintenance/production performance during the application of the paint process.

PPG: Managing customer expectations as they relate to budget constraints, access to asset, surface prep, aesthetics – whether/not they're important and environmental conditions within which the asset exists.

Sherwin-Williams: On the fuel storage end of the oil and gas chain, tank owners are looking for longer-performing lining materials to help reduce operating costs. Currently, the American Petroleum Institute's API 653 tank inspection guidelines require 10-year inspection intervals for tank linings, with the expectation that a 20-year life would be acceptable. However, tanks lined 20 years ago with single-coat epoxies are showing no signs of lining failure and are being recertified for another 10-year inspection period. With these coatings offering the potential of at least a 30-year interval between lining applications, it's possible that inspection intervals will eventually expand to, say, 15 years, which would enable owners to eliminate one complete inspection cycle over 30 years, an efficiency that would add up to significant savings.

CW: How important is substrate preparation as opposed to choosing a higher-end coating?

AkzoNobel: Both are equally important and have an impact on performance. Adhesion and substrate preparation are critical for corrosion protection. Corrosion and application field failures are often due to loss of adhesion and in many cases poor surface preparation and therefore lack of performance are identified as the root cause. Unfortunately, a high-end coating will not overcome the lack of bonding to such surfaces but choosing the right coating system based on end use is also crucial. For example, high UV exposure climate areas require durable coatings which will withstand degradation and therefore protect against delamination.

Axalta: Surface preparation is one of the most important factors, whether using a simple air-drying primer at $5 per liter or a fluoropolymer-based coating at $200 per liter, if applied onto an inadequately prepared surface the coating system will ultimately fail prematurely. Any coating system selection should be considered inclusive of pretreatment.

Hempel: Substrate preparation is always critical to ensure that the coating system performs to the optimum. Even when applying the highest performing coating system, if there has been inadequate surface preparation then this will undermine it.

PPG: It depends on the asset and the application. {There needs to be a] balance between customer expectations and desired outcome. Substrate prep is critical, however, there are coatings that make up for poor/minimal surface prep. [Another consideration is] long-term performance versus economics of proper surface prep.

Sherwin-Williams: Completing surface preparation to an established standard is the foundation for the successful long-term performance of a coating system. However, applicators sometimes encounter substrates that can't be prepared to the proper standard before applying coating systems. In these situations, the substrate may have a marginally prepared surface that's far from the recommended surface preparation for the coating's intended service. Yet, such surfaces can be coated successfully – and deliver long-term performance – when applicators appropriately address two critical factors: the maximum achievable surface preparation and the proper coating system selection. ***CW***

MIXING EQUIPMENT DIRECTORY

Here is a look at the latest offerings from select mixing equipment suppliers. For more information on the products listed, please contact the company directly.

American Machining, Inc.

Fenton, MI
877-629-0091
Fax: 810-629-0046
tiffany@ibcresouce.com
www.ibcresource.com

Poly-Ship & Mix

Attributes/comments: The Poly-Ship & Mix is an innovative solution for companies who mix and ship products. This new patent pending mixer allows you to do both. It is engineered with an airtight Teflon seal that meets all DOT and safety requirements. It has a stainless steel shaft contained within a sealed cap with bearings for a smooth running application. Can be sold stand alone with a bridge attachment or as a full mounted mixing system.

A.W.T. World Trade, Inc.

Chicago, IL
773-777-7100
Fax: 773-777-0909
sales@awtworldtrade.com
www.awt-gpi.com

Tornado Ink Mixer Ink Mixer & Color Blender

Attributes/comments: A.W.T.'s Tornado Ink Mixer & Color Blender is ideal for mixing matched colors, adding pigments such as glitter or fluorescent color to bases, and for assuring proper blending of reducers and other modifiers. The unique design of the Tornado saves time by mixing right in the original container.

Press-Mate Ink Feeding System

Attributes/comments: A.W.T.'s Press-Mate Ink Feeding System dispenses controlled amounts of conventional or U.V. inks and coatings to any press for uninterrupted production. Affix the feed tubes to your press or screen coater and the system will relay inks and coatings when and where you want them, in properly measured amounts.

Buhler Inc.

Mahwah, NJ
201-847-0600
gdnorthamerica@buhlergroup.com
www.buhlergroup.com/wetgrinding_dispersing

Visconomic+

Attributes/comments: Visconomic+ allows high flow rates even with high viscous products. The unique process chamber design provides efficient wet grinding and dispersing. Visconomic+ has flexible control options and provides temperature control while the ceramic inner liner offers efficient cooling and improved wear performance.

Blade Depot (A division of Norstone, Inc.)

Bridgeport, PA
484-684-6986
Fax: 610-275-2404
sales@bladedepot.net
www.bladedepot.net

Polyblade DHS with diamond shaped teeth and pumping scoops

Attributes/comments: Diamond shaped teeth. Easy cleaning. Lower amperage. 3, 6 or 9 scoops. 1-4 teeth between scoops. Available in one sided for air entrainment reduction. Handles ALL viscosities. Never sharpens. Dual sided. Lasts far longer than steel blades even when used with media.

Charles Ross & Son Company

Hauppauge, NY
631-234-0500
mail@mixers.com
www.mixers.com

Improved Multi-Shaft Mixer

Attributes/comments: ROSS unveiled improvements to the dual-post hydraulic lift and seal design of its 1,500-gallon Multi-Shaft Mixer (Model PVM-1500). The new lifting design is a double-acting, fully hydraulic cylinder operating at a much higher pressure, allowing for a smaller cylinder and significantly less oil for operation. In addition, the new seal arrangement allows seal replacement without removing agitator shafts. Unlike the historical design, seal replacement no longer requires removal of the mixer from the tank nor tank entry to access the seal.

Custom Milling & Consulting, Inc.

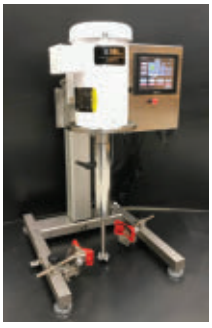
Fleetwood, PA
610-926-0984
Fax: 610-926-0984
sales@cmcmilling.com
www.cmcmilling.com

Planetary Plus Mixer

Attributes/comments: CMC's line of Planetary Plus Mixers provide a powerful "combination" of mixing elements for the most demanding high viscosity, high shear, and temperature sensitive products. The mixer is constructed with a pair of planetary finger blades, high shear dispersing blade, and a side wall scraper. Each finger blade rotates on its own axis while simultaneously orbiting around the mixing vessel while the high shear blade is mounted in the center. The angled design of the finger blades pumps the materials up from the bottom and down from the top to insure complete turnover.

EMImills – Engineered Mills, Inc.

Grayslake, IL
847-548-0044
Fax: 847-548-0099
Dave.Peterson@EMImills.com
www.EMImills.com



EMImills Lab & Pilot Mixer - Disperser with Data Collection

Attributes/comments: The EMImills Mixers & Dispersers are available with PLC controls and data collection that provides scalable and reproducible results. Information including RPM, power (Kwh) consumed, product temperature, time, tip speed, etc. can be saved during processing and downloaded to a spread sheet for review. Available in different mixer sizes and horsepowers.

Glen Mills, Inc.

Clifton, NJ
973-777-0777
Fax: 973-777-0070
sales@glenmills.com
www.glenmills.com

Kakuhunter Centrifugal Planetary Mixer

Attributes/Comments: The Kakuhunter Centrifugal Planetary Mixer mixes viscous liquids and pastes, blends in powders, and degasses entrained bubbles. In one or two containers samples are rapidly turned in two directions (rotation and revolution) into a homogenous product. Ten models with controlled speeds, and option to work with long barrel syringes. GLEN MILLS handles testing, rentals, and sales.

Hero Products Group

Vancouver, Canada
604-522-6543
Fax:
604-522-8735
sales@hero.ca
www.hero.ca

S2650 5-Gallon Shaker

Attributes/comments: S2650 is a quiet, sturdy and reliable 5-gallon shaker with a small footprint that combines vibrational technology with a clamping system that thoroughly mixes from a 1/2 pint to a 5 gallon container, including cases; increasing efficiency and versatility.

Hockmeyer Equipment Corporation

Elizabeth City, NC
800-906-7278
Fax: 252-338-4705
sales@hockmeyer.com
www.hockmeyer.com

HHL Mixer

Attributes/comments: The Hockmeyer HHL Mixer series can be dual or triple shaft units available in XP or TEFC configurations. There are high speed and low speed options available, including the helical sweep with Patented dual reversible scraper system.

Jaygo, Incorporated

Randolph, NJ
908-688-3600
Fax: 908-688-6060
rosanne.deluca@jaygoinc.com
www.jaygoinc.com

Double Arm Mixer Extrude

Attributes/comments: Jaygo recently supplied a Double Arm Mixer Extruder of 2,500 liters for the manufacture of

viscous, pasty food coatings. The unit was manufactured according to the customer's special request, including overlapping mixing blades which is very unique for this type of equipment. The mixer includes a heavy-duty extrusion screw which allows the customer to discharge product in the shape of a log which can be easily handled or further processed. Both Mixing Blades and Extrusion Screw are variable speed, forward and reverse, to allow maximum flexibility and batch control. The mixers can be supplied from 5,000-9,000 liter capacity.

Myers Mixers

Bell, CA
323-560-4723
Fax: 323-771-7789
sales@myersmixers.com
www.myersmixers.com

Horizontal Mixer

Attributes/comments: Myers Mixers introduces a 900-gallon working capacity horizontal vacuum mixer for intermediate-speed blending of viscous coatings. 8 bolt-on-style axial turbine blades homogenize the batch with minimal shear. Bolted end allows access for simplified maintenance and cleaning.

NETZSCH Premier Technologies

Exton, PA
484-879-2020
info.npt.@netzsch.com
www.netzsch.com/gd

Epsilon

Attributes/comments: A new, compact solution for producing homogeneous dispersions with reproducible quality in an inline process. The Epsilon inline disperser is operated in circulation mode, whereby the powder can be fed from a bag via suction lance or bag feeding station.

Psi-Mix

Attributes/comments: The Psi-Mix inline disperser combines a new dispersion method, in which the solid components are wetted on a large liquid surface, with emission-free, dust-free inline operation. The combination of vacuum dispersion, shearing and pressure wetting results in homogeneous, fine dispersions.

Union Process, Inc.

Akron, OH
330-929-3333
unionprocess@unionprocess.com
www.unionprocess.com

PT5 laboratory mixer

Attributes/comments: The PT5 lab model mixer by Union Process is made with stainless steel and jacketed for cooling. It includes a pump for circulation and is a sealed system to prevent oxidation. Also, it is built on a mobile cart for maximum versatility to move to different areas of the lab.

Shanghai ELE Mechanical & Electrical Equipment Co., Ltd

Shanghai, China
+0086-21-55387553
Fax: +0086-21-65444615
ele@elemix.cn
www.ele-mix.com

Ultra-fine nano bead mill Turbo type

Attributes/comments: ELE Turbo type bead mill is a high energy and energy concentrated wet grinding mill. The optimization design of its accelerated wheels will pass more powerful energy to the grinding medium. Particle size distribution is narrow.

Nano grinding and high viscosity bead mill

Attributes/comments: ELE pin type bead mill is a high energy and energy concentrated wet grinding mill suitable for high, middle and low viscosity. Narrow particle size distribution.

Sunin Machine Co. Ltd.

New Taipei City, Taiwan
+886-2-22407863
Fax: +886-2-22402596
sunin168@ms31.hinet.net
www.sunin-machine.com

Dispersion mixer

Attributes/comments: Dispersion mixer is a machine suitable for work in narrow spaces in laboratories, with a handy and practical design. The double-purpose mixing cup can be cooled and heated through a pipe connector according to different formulas. The innovative working structure can realize both mixing and dispersion, and reduce material loss and environmental pollution during the transfer by the peripheral pump. **CW**

Cardanol – An Eco-friendly Isocyanate Blocking Agent

Deblocking Performances and Methods to Optimize Deblocking Temperature

Yun Mi Kim and Anbu Natesh, *Cardolite Corporation, Monmouth Junction, NJ; Pietro Campaner, Cardolite Corporation, Q1 Strada Statale 14, km 163,5 34149 Basovizza (TS), Italy*

Abstract

Cardanol, a well-known non-edible natural oil derived from the cashew nut shell liquid, is a USDA certified bio-based product. Once used as a very high purity grade (NX-2026,™ 3-pentadeca-dienyl-phenol) in PU prepolymers, this substance has demonstrated various benefits including favorable deblocking conditions, lower viscosity, and excellent storage stability compared to commonly used phenolic compounds.

One of the most known deblocking methods involves exposure to elevated temperatures, i.e., 150 °C – 200 °C. However, not all substrates (e.g., plastics) and applications can accommodate such high temperatures for deblocking, thus, the possibility to optimize deblocking conditions can be a valuable tool to further expand the applicability of 3-pentadeca-dienyl-phenol as a label-friendly polyurethane prepolymers' blocking agent.

In this study, we present different approaches to control NX-2026 deblocking conditions. First, 3-pentadeca-dienyl-phenol blocked prepolymers were prepared starting from different diols (e.g., PPG, polyester, CNSL-based) as well as aromatic (MDI, TDI) and aliphatic (HDI, IPDI) isocyanates. These were subsequently characterized for their deblocking temperatures and used as model substrates for the study. Key factors for controlling deblocking conditions such as catalysts, deblocking agents (amines, polyols), and solvents were investigated.

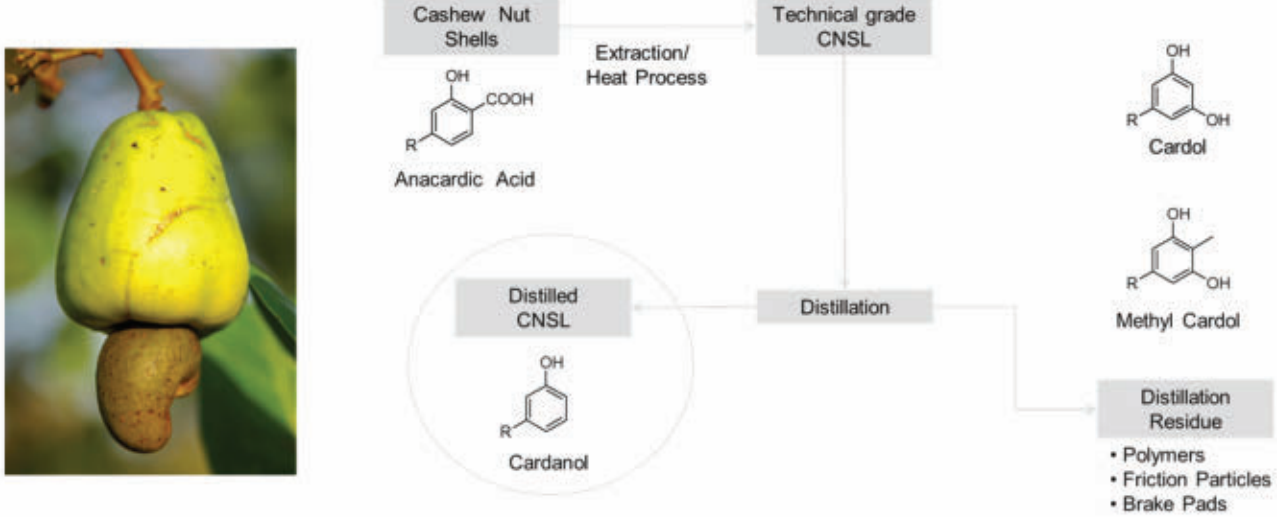


Figure 1: *Anacardium Occidentale* fruit (left) and schematic process for cardanol recovery (right).

Introduction

Cashew Nut Shell Liquid (CNSL), largely available in the entire sub-tropical areas (Brazil, India, Vietnam, Ivory Coast, etc.), is a non-food-chain industrial oil found in the honeycomb structure of the cashew nutshell *(Anacardium Occidentale)*, and is typically considered a by-product of the cashew nut industry. The main product isolated by vacuum distillation of CNSL under proper conditions is cardanol, a USDA certified bio-based (>98% bio-content) alkenylphenolic product with an average number of two unsaturations on the C_{15} side-chain (Figure 1).

Cardanol represents an interesting and versatile monomer, as it contains three different functional groups (the aromatic ring, the hydroxyl group and the double bonds in the alkyl chain), that can be either selectively or simultaneously modified according to the expected features of the final product (Figure 2).

Given its peculiar chemical structure, several chemical routes to cardanol-based derivatives have been reported in the literature, including epoxies, amine curing agents, surfactants, friction particles, and phenolic resins.[1] For example, one of the most successful CNSL applications are epoxy curing agents, a type of derivatives exhibiting good reactivity for fast and low temperature cure, strong adhesion even to damp or poorly prepared surfaces, excellent water resistance, corrosion protection and chemical resistance in epoxy formulations, all properties imparted by cardanol's peculiar chemical backbone.

All the average benefits described above have also been exploited in sectors like polyurethane systems, where cardanol has been described as a useful building block for polyols and derivatives suitable for 2K PU applications,[2] aiming, for example, to improve PU adhesives and coatings durability by imparting hydrophobicity and chemical resistance.

In order to further confirm the versatility of cardanol and its potential applicability in different sectors like 1K PU systems, among all the other grades already available in its portfolio, we recently developed a proprietary process

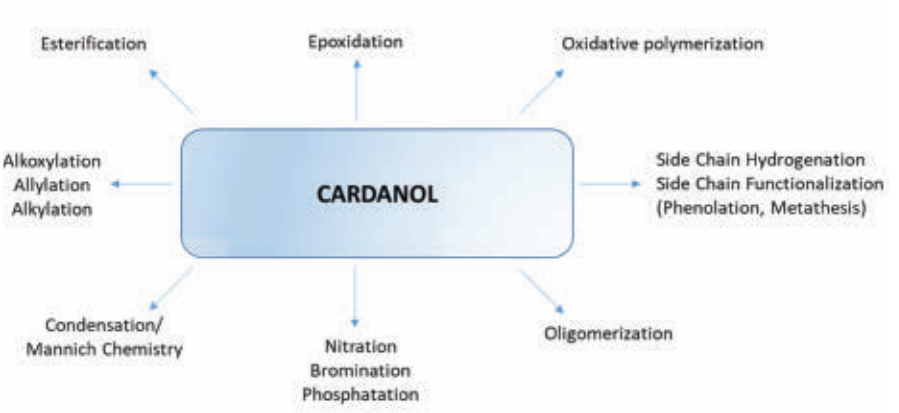


Figure 2: Examples of cardanol's potential functionalization.

Figure 3: NX-2026 (3-pentadeca-dienyl-phenol) chemical structure.

for the recovery of the 3-pentadeca-dienyl-phenol [NX-2026 (Figure 3)].

NX-2026 has been specifically optimized to provide a light color and high purity raw material with reproducible hydroxyl value and functionality, overcoming the limitations of lower purity grades (generally simply called "cardanol"), such as smell, presence of by-products (e.g., cardol, 2-methyl-cardol) and potential batch to batch variability. Even if still applicable in the typical CNSL-based chemistries described above, NX-2026 offers further benefits, like being a valid alternative to common PU prepolymers petro-based blocking agents.

Materials and Methods

NX-2026 was selected as the blocking agent for isocyanates and lab prepared prepolymers. Prepolymers were prepared starting from commercially available diols (polyester, polyether) according to the following procedure: to a weighed amount of isocyanate pre-heated at 50 °C and stirred under nitrogen atmosphere, the selected diol was added dropwise, keeping mixture temperature around 65 °C. Once the addition was completed, the system was stirred under nitrogen atmosphere at 65-70 °C, monitoring prepolymer formation by NCO titration (ASTM D2572) on a METTLER TOLEDO T50 automatic titrator. When the desired NCO content was obtained, the prepolymer was then blocked by adding NX-2026, keeping reaction temperature around 65-70 °C under nitrogen flush and monitoring NCO disappearance by titration. A similar procedure was used to make isocyanate-NX-2026 adducts, still monitoring full NCO capping by automatic titration.

Deblocking temperatures were determined by differential scanning calorimetry (DSC) on a METTLER TOLEDO DSC1 STAR System equipped with a HUBER TC45 thermostat. Gel permeation chromatography(GPC) analysis for molecular weight characterization of NX-2026-blocked isocyanates was performed on a HITACHI HPLC-GPC systems, isocratic mode (0.5 ml/min flow rate; wavelength set to 280 nm; Tosoh TSKgel Super H1000, Tosoh TSKgel Super H2000, Tosoh TSKgel Super H3000 columns 3 µm, 6x150 mm connected in series; mobile phase: tetrahydrofuran).

Results and Discussion

The benefits of blocked isocyanates are well-known in various industries including coatings and adhesives.[3] Blocked isocyanate and blocked polyurethane prepolymer technology enable 1K polyurethane systems with reduced free isocyanates and extended storage stability by minimizing moisture sensitivity of the system. Coating applications such as electrodeposition, electrostatic spraying, powder coating, insulating wire coating, and coil coatings have extensively

explored this technology because this approach provides a solution to minimize health concerns from free isocyanate exposure while allowing coatings to cure by heat. In the case of blocked prepolymers, they are used in 1K and 2K epoxy-amine adhesives, 1K polyurethane hot-melts, pressure sensitive adhesives, and sealants.

Commonly used isocyanate blocking agents include phenol, nonylphenol (NP), methylethylketoxime (MEKO), alcohols, ε-caprolactam, amides, imidazoles, and pyrazoles. The chemical structure of the blocking group has a major impact on the deblocking temperature and cure rate of the coating or adhesive, and also impacts volatile content and final properties. Phenol or substituted phenols have been employed as isocyanate capping agents for many years, but recent health concerns over toxicity of these molecules offered opportunities to develop safer and affordable alternatives.

Cardolite has recently developed, through a proprietary technology, a very high purity product (99.5% pure as per GC analysis) commercially available under the trade name of NX-2026™ (3-pentadeca-dienyl-phenol). This grade has been studied as the most suitable bio-based, non-toxic alternative to aromatic blocking agents (phenol, nonylphenol).

In order to first determine the behavior of NX-2026 as an NCO blocking agent, model isocyanate-NX-2026 adducts were prepared, using both aliphatic and aromatic isocyanates (MDI, TDI, IPDI, HDI, pHDI) and resulting adducts were then characterized for their deblocking temperatures.

Among all the analytical techniques (IR, TGA, UV-Vis, NMR, GC, GC-MS, titration, CO2 evolution, Gel Time, X-Ray Photoelectron Spectroscopy) applicable to estimate deblocking temperatures of blocked prepolymers,[4] DSC was selected, due to easy and quick sample preparation, a wide range of temperatures that could be screened and method sensitivity.[5]

In typical DSC experiments, all the substrates (NX-2026 blocked isocyanates) were heated from 25 °C to 250 °C at 10 °C/min under nitrogen, according to similar conditions already described in the literature.[6]

Blocking Agent	Isocyanate Type	Appearance	Viscosity at 25 °C (cps)	Deblocking Temperature (°C)
Cardanol	TDI	Yellowish liquid	344	115
	MDI	Yellowish waxy solid	-	145
	HDI	Amber liquid	115	155
	IPDI	Yellowish liquid	2895	130
	pMDI	Yellowish liquid	151	170
Phenol	TDI	White solid	-	164
	MDI	White solid	-	204
	IPDI	White solid	-	160
Nonylphenol	TDI	Thick colorless liquid	-	185
ε-caprolactam	TDI	White solid	-	150

Table 1: Appearance and deblocking temperatures of blocked isocyanates.

Blocking Agent	Isocyanate Type	Deblocking Temperature (°C)	Deblocking Time at 160 °C
Cardanol	PPG prepolymer (10.4% NCO)	128	58 sec
Phenol	PPG prepolymer (10.4% NCO)	140	77 sec

Table 2: Deblocking temperature and time for blocked PPG prepolymers.

NX-2026 blocked isocyanates showed reduced viscosity compared to those of NP, phenol blocked systems and also exhibited favorable deblocking temperatures (Table 1).

With these first results available, the study proceeded further, preparing a first model prepolymer (based on a polypropylene glycol-based diol with a MW of 1000 Da, monomeric MDI and with a 10.4% free NCO content) and fully blocking the isocyanate functional group by phenol and cardanol, respectively.

Cardanol-blocked prepolymer exhibits a slightly lower deblocking temperature and faster deblocking time at 160 °C compared to that of phenol (Table 2), as per DSC analysis under the same conditions previously reported.

Substrate	Average deblocking Temperature (°C)
Alkyl-NHCOO-Alkyl	250
Aryl-NHCOO-Alkyl	200
Alkyl-NHCOO-Aryl	180
Aryl-NHCOO-Aryl	120

Table 3: Typical average deblocking temperatures for different PU substrates.

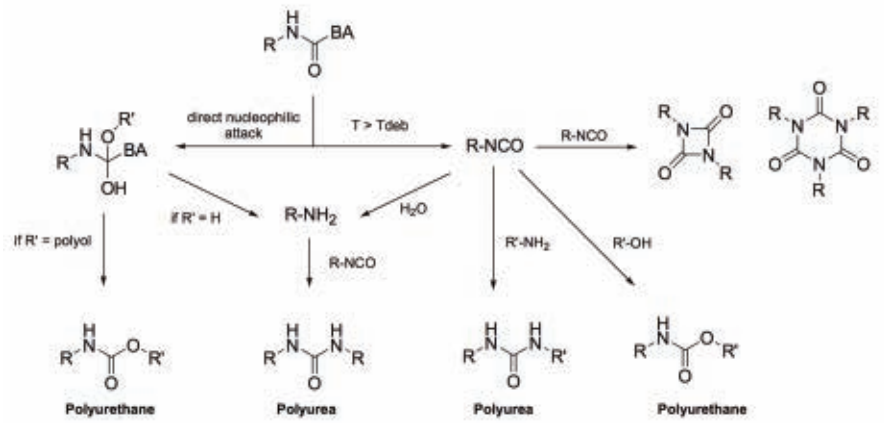


Figure 4: Possible reactions of blocked isocyanates.

On the basis of these first results and aiming to confirm that NX-2026 blocked substrates follow the same deblocking temperature trends as typical blocking agents (Table 3,[7]), a wider set of polypropylene glycol (MW 2000 Da) based prepolymers obtained from different isocyanates (TDI, MDI, HDI, IPDI) with an average 4% free NCO content were prepared and fully blocked by NX-2026.

Since the first data collected (Tables 1, 2) show that NX-2026 is characterized by relatively high deblocking temperatures, that might limit its potential use as a versatile blocking agent in applications where very fast cure profiles are required or where substrates to be treated are thermosensitive (e.g., plastics).

To address this topic and further investigate all the reaction pathways that blocked isocyanates could be subjected to (Figure 4,[8]), in addition to simple thermal deblocking, the impact of catalysts, chain extenders with different nucleophilicity (e.g., polyols and amines) or their combination were investigated.

Using the very first NX-2026-isocyanate adducts described above as substrates, different catalysts (tertiary amines, alkanolamines, metals[9]) were added (0.8% w/w), in order to check their potential capability to lower deblocking temperatures (Table 4).

Triethylenediamine (TEDA) in dipropylene glycol and potassium-octoate in diethylene glycol show the highest effect/deblocking efficiency within the series, while other options are still suitable, but showing a slightly lower contribution. Even if suitable for a first screening, basic isocyanate-NX-2026 adducts are not truly representative of the polymeric substrates used in 1K PU applications; for this reason, the same catalysts have been tested on the NX-2026-blocked prepolymers previously mentioned (Table 5).

A similar trend as for basic adducts is observed as well, with potassium-octoate in diethylene glycol and TEDA showing the biggest effect, with a quite significant drop on prepolymers deriving from aromatic isocyanates (MDI or TDI).

With these promising results available, the study was further extended to slightly more complex systems, evaluating the use of chain extenders (as such or in combination with catalysts) characterized by different nucleophilicity (polyols and amines).

When a propoxylated sorbitol-based polyol (OH 300 mg KOH/g) is used as a potential chain extender (at a stoichiometric level with respect to the prepolymer's equivalent weight), a reduction in deblocking temperature is observed, becoming even more significant when catalysts (0.8% w/w with respect to overall substrate amount) are included in the blend (Table 6).

The evident effect of metal catalysts (e.g., dibutyltin dilaurate or potassium octoate) on deblocking temperatures can be explained by their ability to generate very nucleophilic metal alkoxylates in the presence of polyols and polar solvents (such as DEG, in the case of potassium octoate glycolic solution). The

	Deblocking temperature (°C)		
Catalyst	**NX-2026_TDI**	**NX-2026_IPDI**	**NX-2026_pHDI**
None	**~118**	**~140**	**~120**
1,4-diazobicyclo [2.2.2] octane (DBO)	NO evident effect	~116	NO evident effect
Acid blocked tertiary amine (DABCO 8154)	**~82**	~117	n.a.
Potassium-octoate in diethylene glycol (DABCO K15)	~92	**~82**	~114
Triethylenediamine in Dipropyl-eneglycol (Tegoamin 33)	NO evident effect	~70	**~88**
Zinc acetylacetonate (Tegokat 623)	~95	~110	~114
Tin Dibutyl dilaurate (DABCO T12)	~98	~135	~108
Zinc amine catalyst (K-KAT XK-614)	NO evident effect	~100	~106
N, N-Dimethylethanolamine (Tegoamin DMEA)	**~85**	NO evident effect	NO evident effect
tris-2,4,6-dimethylaminomethyl phenol (Ancamine K54)	NO evident effect	~92	~98

Table 4: Effect of catalysts on deblocking temperatures of NX-2026-isocyanate adducts.

Catalyst	Deblocking temperature (°C)			
	PPG_MDI_ NX-2026	PPG_TDI_ NX-2026	PPG_HDI_ NX-2026	PPG_IPDI_ NX-2026
None	**~165**	**~120**	**~186**	**~178**
1,4-diazobicyclo [2.2.2] octane (DBO)	n.a.	n.a.	n.a.	~120
Acid blocked tertiary amine (DABCO 8154)	~98	NO evident effect	~134	NO evident effect
Potassium-octoate in diethylene glycol (DABCO K15)	**~60**	~105	**~80**	**~76**
Triethylenediamine in Dipropyleneglycol (Tegoamin 33)	~86	**~80**	~120	~160
Zinc acetylacetonate (Tegokat 623)	~96	~105	~140	~90
Tin Dibutyl dilaurate (DABCO T12)	n.a.	n.a.	~117	~124
Zinc amine catalyst (K-KAT XK-614)	~112	~110	n.a.	~100
tris-2,4,6-dimethylaminomethyl phenol (Ancamine K54)	~120	NO evident effect	~150	~104

Table 5: Effect of catalysts on deblocking temperatures of NX-2026-blocked prepolymers.

same mechanism is also described in the literature as a useful tool to depolymerize PU matrices like flexible foams (Figure 5[10]).

Various model NX-2026-blocked prepolymers were tested and characterized for their deblocking temperatures as neat substrates or when catalysts were included in the blend (Table 7). In particular, a polyester diol (OH 56 mg KOH/g), a PPG-based diol (OH 56 mg KOH/g), a PTHF-based diol (OH 56 mg KOH/g) and NX-9201LP (CNSL-based diol, OH 65 mg KOH/g) were selected as starting diols for prepolymer synthesis, in combination with monomeric MDI and polymeric HDI as isocyanates. The resulting prepolymers were characterized by their different free NCO content prior to NX-2026 blocking, being 6% for the polyester diol/MDI prepolymer, 10.5% for the PPG/pHDI prepolymer, 3.6% for the PTHF/MDI prepolymer and 4.0% for the CNSL-diol/MDI prepolymer.

The same synthesis conditions to make the starting prepolymers and to achieve their complete blocking by NX-2026 were adopted, confirming the applicability of NX-2026 as a blocking agent. Two of the catalysts previously described (TEDA in dipropylene glycol and dibutyltin dilaurate) were tested, showing a contribution to deblocking temperature reduction comparable to previous results (Table 7).

As evident from the results shortlisted in Tables 5-7, amine- and metal-type catalysts diluted with glycols (e.g., Tegoamin 33 and DABCO K15) show the overall best effect in reducing the deblocking temperatures of blocked prepolymers. However, their high nucleophilicity could potentially limit their applicability in 1K systems, due to limited shelf-life (stability) of the blocked prepolymers.

To confirm this assumption, the four model NX-2026-blocked PPG-based prepolymers used for the study were characterized for their molecular weight variation (by GPC) after storage for 10 days at 50 °C (corresponding to ~3 months at room temperature), both as neat samples and as added with catalysts (Tegoamin 33; DABCO K15; 0.8% load with respect to the substrate).

If a significant amount of deblocking occurs over storage time, then the resulting free prepolymer can crosslink (also favored by the presence of a catalyst), thus causing an increase in molecular weight or, in general, a significant difference in the MW distribution.

Even if there could potentially be factors affecting the accuracy of molecular weight characterization based

Catalyst	Deblocking temperature (°C)			
	PPG_MDI_ NX-2026 + Polyol	PPG_TDI_ NX-2026 + Polyol	PPG_HDI_ NX-2026 + Polyol	PPG_IPDI_ NX-2026 + Polyol
None	**~112**	**~94**	**~128**	**~132**
1,4-diazobicyclo [2.2.2] octane (DBO)	~85	n.a.	n.a.	n.a.
Potassium-octoate in diethylene glycol (DABCO K15)	~65	~45	~68	~65
Triethylenediamine in Dipropyleneglycol (Tegoamin 33)	~94	~67	~120	~126
Tin Dibutyl dilaurate (DABCO T12)	~90	~90	~100	~115
tris-2,4,6-dimethylaminomethyl phenol (Ancamine K54)	~94	~78	NO evident effect	NO evident effect
Dimethyl benzylamine (DMBA)	n.a.	NO evident effect	NO evident effect	n.a.

Table 6: Effect of chain extender (polyol) and catalysts on deblocking temperatures of NX-2026-blocked prepolymers.

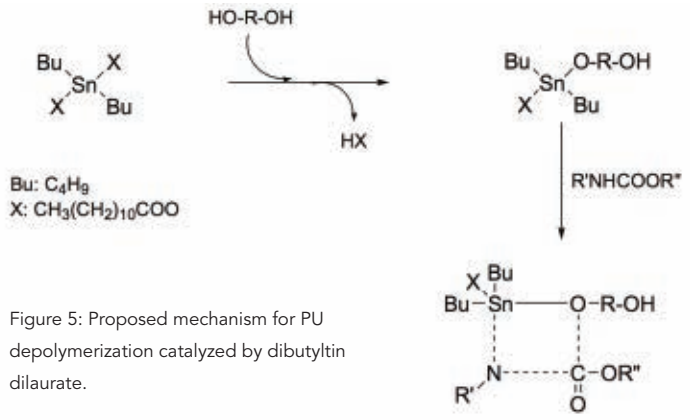


Figure 5: Proposed mechanism for PU depolymerization catalyzed by dibutyltin dilaurate.

	Deblocking temperature (°C)			
Catalyst	**Polyester diol_MDI_ NX- 2026 + Polyol**	**PPG diol_ pHDI_NX-2026 + Polyol**	**PTHF diol_MDI_ NX- 2026 + Polyol**	**CNSL-diol_MDI_ NX-2026 + Polyol**
None	**~101**	**~125**	**~104**	**~109**
Triethylenediamine in Dipropyleneglycol (Tegoamin 33)	~74	~120	~85	~86
Tin Dibutyl dilaurate (DABCO T12)	~88	~98	~79	~93

Table 7: Use of catalysts to tune deblocking temperatures on other types of NX-2026-blocked prepolymers.

	Deblocking temperature (°C)			
Catalyst	**PPG_MDI_ NX-2026**	**PPG_TDI_ NX-2026**	**PPG_HDI_ NX-2026**	**PPG_IPDI_ NX-2026**
None	**7.2**	**2.3**	**7.9**	**5.3**
Potassium-octoate in diethylene glycol (DABCO K15)	339.1	515.4	130.6	521.3
Triethylenediamine in Dipropyleneglycol (Tegoamin 33)	137.9	438.9	16.0	15.8

Table 8: MW variation (%, determined by GPC) of NX-2026-blocked PPG prepolymers in presence of very effective deblocking catalysts Tegoamin 33 and DABCO K15 after storage at 50 °C for 10 days.

	Deblocking temperature (°C)			
Catalyst	**PPG_MDI_ NX-2026 + Polyol**	**PPG_TDI_ NX-2026 + Polyol**	**PPG_HDI_ NX-2026 + Polyol**	**PPG_IPDI_ NX-2026 + Polyol**
None	**32.5**	**200.7**	**8.4**	**16.8**
Potassium-octoate in diethylene glycol (DABCO K15)	265.9	170.8	457.1	661.5
Triethylenediamine in Dipropyl-eneglycol (Tegoamin 33)	213.9	238.2	22.5	32.3

Table 9: MW variation (determined by GPC) of NX-2026-blocked PPG prepolymers in presence of a chain extender (propoxylated sorbitol polyol) and of very effective deblocking catalysts Tegoamin 33 and DABCO K15 after storage at 50 °C for 10 days.

on hydrodynamic volume comparison between polymer standards (e.g., polystyrene) and polymer analytes having different chemistries, GPC represents quite a useful tool to screen several substrates by using small amounts of materials. The thus obtained MW variations (Table 8) showed good stability for neat blocked prepolymers. When Tegoamin 33 is used, aliphatic isocyanates (HDI, IPDI) derived prepolymers show a limited variation in MW, while it becomes more evident for aromatic systems (MDI- and TDI-based). The effect is even worse for DABCO K15 containing blends, almost all showing a complete gellation.

The same characterization was extended to systems where the same blocked prepolymers were blended with a polyol as chain extender (as described in Table 6), still using Tegoamin 33 and DABCO K15 as catalysts.

In this case, the contribution of both chain extender and catalyst results in a higher MW variation (Table 9), that, even if less marked for HDI and IPDI systems, still highlights the limited applicability of very active catalysts (e.g., DABCO K15) in 1K PU systems as a tool to reduce deblocking temperatures without affecting blocked prepolymers shelf-life.

These results prompted the search for possible alternative catalysts, able to contribute to the reduction of the deblocking temperature (even if lower than for the former ones), but without affecting systems shelf-life. Considering the results obtained with aromatic isocyanate-derived prepolymers, whose shelf-life is highly reduced by the presence of catalysts, specific attention was given to the same model NX-2026-blocked MDI- and TDI-based PPG prepolymers used in the rest of the study.

The second set of catalysts (still selected among amine- and metal-based ones) show a lower effect on deblocking temperatures with respect to the most efficient ones belonging to the first series (e.g., Tegoamin 33 or DABCO K15), but still providing a significant deblocking temperature reduction for all the model prepolymers, with or without the presence of a polyol as curing agent (Table 10).

Following exactly the same approach

Catalyst	Deblocking temperature (°C)			
	PPG_MDI_ NX-2026	PPG_TDI_ NX-2026	PPG_MDI_ NX-2026 + Polyol	PPG_TDI_ NX-2026 + Polyol
None	**~165**	**~120**	**~112**	**~94**
N,N,N,-tris(3-dimethylaminopropyl)-amine (Polycat 9)	~91	~102	~95	~74
bis(2-dimethylaminoethyl) ether in 70% dipropylene glycol (NIAX A-1)	~50	~85	~94	~80
Stannane, dibutylbis(dodecylthio) (DABCO T120)	~75	~80	~90	~85
Bismuth carboxylate catalyst (K-KAT XK-640)	~72	~83	~102	~81
Organometallic complex catalyst (K-KAT XK- 672)	~92	~102	~102	~94

Table 10: Effect of chain extender (polyol) and alternative catalysts on deblocking temperatures of NX-2026-blocked prepolymers.

Catalyst	MW variation, % (GPC)			
	PPG_MDI_ NX-2026	PPG_TDI_ NX-2026	PPG_MDI_ NX-2026 + Polyol	PPG_TDI_ NX-2026 + Polyol
None	**7.2**	**2.3**	**32.5**	**200.7**
Potassium-octoate in diethylene glycol (DABCO K15)	339.1	515.4	265.9	170.8
Triethylenediamine in Dipropyl-eneglycol (Tegoamin 33)	137.9	438.9	231.9	238.2
N,N,N,-tris (3-dimethylaminopropyl)-amine (Polycat 9)	85.2	574.4	186.2	352.0
Stannane, dibutylbis(dodecylthio) (DABCO T120)	9.4	93.3	141.2	310.9
Bismuth carboxylate catalyst (K-KAT XK-640)	6.5	61.9	179.5	509.5
Organometallic complex catalyst (K-KAT XK- 672)	0.3	12.8	64.2	137.5

Table 11: MW variation (determined by GPC) of NX-2026-blocked PPG prepolymers in presence of a chain extender (propoxylated sorbitol polyol) and of alternative catalysts after storage at 50 °C for 10 days.

Amine	Deblocking temperature (°C)			
	PPG_MDI_ NX-2026 + Amine	PPG_TDI_ NX- 2026 + Amine	PPG_HDI_ NX-2026 + Amine	PPG_IPDI_ NX- 2026 + Amine
None	**~165**	**~120**	**~186**	**~178**
Polyetheramine (Jeffamine D230)	~45	~27	~90	~70
CNSL-based phenalkamine (LITE 2002)	~42	~27	~88	~88
Isophoronediamine (IPDA)	~33	~1	~60	~60

Table 12: Effect of chain extender (amine) and catalysts on deblocking temperatures of NX-2026-blocked prepolymers.

as previously described, testing by GPC the MW variation of blends NX-2026-blocked PPG prepolymers as such (Figure 8) and in combination with a chain extender (propoxylated sorbitol polyol) and alternative catalyst (Table 11), after storage at 50 °C for 10 days, new sets of results were collected.

The alternative catalysts show, especially in the case of MDI-based systems, a general lower impact on shelf-life reduction (average lower increase in MW), while with TDI-derivatives there is still an increase in molecular weight (even if lower than for Tegoamin 33 or DABCO K15).

Having confirmed the possibility of extending NX-2026-blocked prepolymers by polyols (also reducing deblocking temperature) as well as the applicability of proper catalysts to further reduce the reaction temperature without affecting blocked prepolymers shelf-life, further experiments were conducted to evaluate the efficiency of amines as chain extenders/curing agents characterized by higher nucleophilicity (Table 12). The four same reference model blocked prepolymers were blended with amines (Jeffamine D230, LITE 2002, IPDA, respectively) at a stoichiometric level using the amine's AHEW (amine hydrogen equivalent weight) with respect to the prepolymer's equivalent weight.

Among the three amines tested as chain extenders (isophorone diamine, polyetheramine, CNSL-phenalkamine), the amine characterized by the lowest molecular weight shows the highest effect on deblocking temperature, probably due to its lower steric hindrance and the subsequent easier access to reactive groups (Figure 6).

The addition of catalysts in amine-type chain extenders can be a possible way to further reduce their deblocking temperatures, if necessary.

All these results confirm the effective applicability of NX-2026 as a versatile NCO-blocking agent suitable for applications ranging from coatings to adhesives to outdoor applications to epoxy-PU hybrid matrices.[11] Depending on the specific type of system

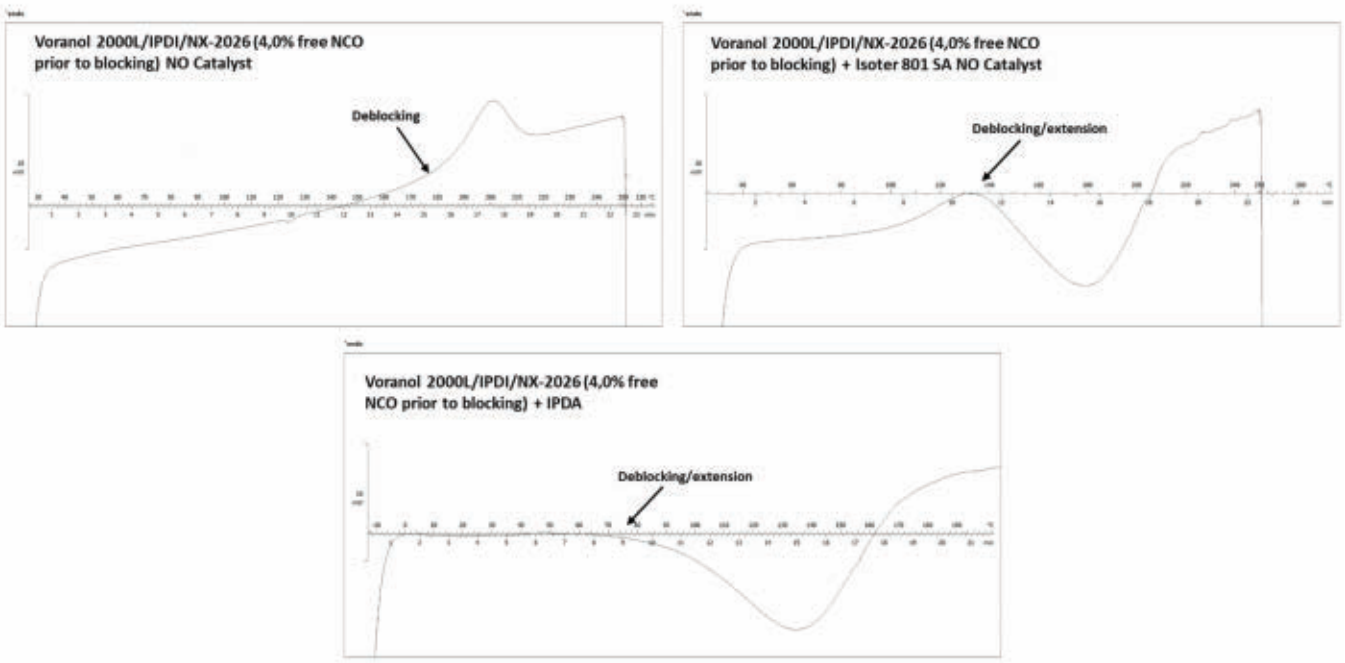


Figure 6: Effect of chain extender (amine) on deblocking temperatures of NX-2026TM-blocked prepolymers.

(1K or 2K), catalysts or chain extenders can be blended into NX-2026 blocked isocyanates-derived adducts, properly tuning their level and nature in order to have good balance between reactivity and formulation stability over time.

Conclusions

Cashew nutshell liquid (CNSL), a non-food chain, bio-renewable alkenyl-aromatic, offers unique chemical features that can be successfully used in polyurethane applications. Its highly pure derivative NX-2026 can be successfully used in 1K systems as an isocyanate blocking agent, representing an efficient alternative to petro-based phenol and nonylphenol. By properly selecting suitable conditions (use of catalysts, chain extenders or their combinations), NX-2026 deblocking temperatures can be tuned, offering formulators a valid and versatile chemical tool.

Future work will focus on expanding the number of NX-2026 blocked systems, with specific attention to different catalysts and their load with respect to the blocked-prepolymer to further improve system stability. ***CW***

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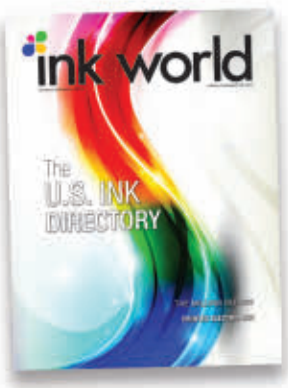

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BASF, Guangdong Provincial Government Sign Framework Agreement to Establish Verbund Site in Zhanjiang, China

Martin Brudermüller, chairman of the board of executive directors, BASF SE, and Lin Shaochun, vice governor of Guangdong Province, signed a Framework Agreement in Ludwigshafen setting out further details of BASF's plan to establish a new smart Verbund site in Guangdong, China.

Following the signing of the Memorandum of Understanding in July 2018, BASF selected the city of Zhanjiang as the location for its second Verbund site in China.

"By 2030, China's share of the global chemical production will increase to nearly 50 percent," Brudermüller said. "Guangdong is a growing market for innovations from chemistry, and our new site will support customers in multiple industries. We aim to help our customers to grow sustainably with our portfolio of products, solutions and services, and at the same time establish new concepts to improve the sustainability of our own operations."

According to the Framework Agreement, fundamental circular economy concepts will be incorporated into the new Verbund site in Zhanjiang, to support customers in the region with sustainably produced solutions. At a Verbund site, resources are conserved through the use of waste and byproducts as raw materials. A smart manufacturing concept is being further developed for the new site on the basis of cutting-edge technologies that maximize resource and energy efficiency and reduce environmental impact. Around 9 km^2 of land will be allocated for the project.

The total investment is estimated to reach up to $10 billion and will be implemented in phases. The project will include a wholly-owned steam cracker with a planned capacity of one million metric tons of ethylene per year and several plants for consumer-oriented products and solutions.

Globally, BASF currently operates six Verbund sites: Two in Europe (Ludwigshafen, Germany; Antwerp, Belgium), two in North America (Freeport, Texas; Geismar, Louisiana) and two in Asia. The Verbund site in Nanjing, China, established in 2000, is a 50/50 joint venture with Sinopec, while the Verbund site in Kuantan, Malaysia, established in 1997, is a 60/40 joint venture with Petronas.

Oxea Lifts Force Majeure in Oberhausen, Germany

Oxea lifted its declaration of force majeure for products from Oberhausen, Germany. The production units there are running at normal capacity again.

The declaration of force majeure had become necessary because of an incident beyond Oxea's control at an important raw material supplier at the Oberhausen site on Nov. 18, 2018. As a result of this operational disruption, Oxea had to temporarily restrict supplies of certain products that the company manufactures in Oberhausen.

The site partner has now successfully rectified the operational disruption. As a result, Oxea now has sufficient raw material at its disposal again and will be able to gradually meet its delivery obligations. Oxea already informed its customers and distributors.

Nouryon Opens New India HQ, Research Center

Nouryon (formerly AkzoNobel Specialty Chemicals) opened a new headquarters and research center to support its operations in India. Located in Mumbai, the new location brings together research and sales as well as business support functions.

Key projects include an expansion and upgrade of Nouryon's organic peroxides facility in Mahad, which is close to completion, as well as a new

Pictured: Alain Rynwalt, sales & marketing director EMEIA, Polymer Chemistry; Ann Lindgärde, regional GM EMEIA, Polymer Chemistry; Shrikant Kulkarni, managing director, India/Courtesy Nouryon

monochloroacetic acid plant in Gujarat. The latter is a joint project with chemicals manufacturing company Atul, a part of Lalbhai Group, and is scheduled to start production later this year.

"India is an increasingly important market for us and these investments clearly demonstrate our commitment to growing with our customers in the region," said Charlie Shaver, CEO of Nouryon. "The chemical industry is regarded as a backbone of India's agricultural and industrial development, and we see good opportunities for sustainable growth."

BASF Increases Production Capacity of Antioxidants for Lubricants

BASF's global business unit Fuel and Lubricant Solutions is investing in Mexico and China to increase production of antioxidants for lubricants.

The capacity expansions address the growing demand for antioxidants from the increasing number of vehicles in Asia and the increasing global demand for long-life lubricant additives.

In Mexico, BASF expanded the production capabilities of its site in Puebla. In China, the expansion is through a technology licensing and manufacturing

agreement with Feiya Chemical Co.

Feiya recently built a new site in Rudong, Jiangsu Province, which is fully operational and producing on-spec products.

"We continue to address the regional and global needs of our customers through investments and product innovation," said Marius Vaarkamp, global marketing director, Lubricant Oil Additives, BASF. "Expanding our global production capacity of antioxidants for lubricants shows our commitment to meeting the increasing needs of an evolving market."

"We value BASF as our partner, and we are committed to meeting the expectations of BASF and its customers," added Hong Seng Cao, chairman and GM, Feiya Chemical Co.

MFG Chemical Receives Plant Safety Performance Improvement Honor

MFG Chemical received an award for Safety Performance Improvement from SOCMA at the trade association's 96th Annual Dinner, held Dec. 10 at the Crowne Plaza in NYC.

"MFG has been working hard to make plant safety the core value of the company, a value which is shared by all of our employees," MFG Chemical CEO Keith Arnold said. "We are happy to receive this industry recognition for our continuous improvements in plant safety, and even more pleased that we have achieved and are maintaining a safe work environment, with a strong EHS&S program."

"As specialty and fine chemical manufacturers, we understand that maintaining a safe environment for your staff and community is not an easy task. It takes time, buy-in from both employees and leadership, and resources to achieve your goals," SOCMA President and CEO Jennifer Abril added. "We congratulate MFG Chemical and its employees for its commitment to strengthening its environmental health and safety efforts. We look forward to MFG Chemical's continued participation in ChemStewards, where there is a platform to learn from each other and share best practices." ***CW***

Conductivity in Flammable and Potentially Explosive Atmospheres

Amy Rigby, Innospec Ltd, Ellesmere Port, CH65 4EY

Wherever there is a flow of liquid, there is the potential to generate static charge. As fluids are pumped, stirred or mixed, solids dissolved or crystallized, charge is generated at interfaces. The rate of flow, the conductivity of the liquid, and the diameter of the vessel or pipe have a dramatic effect on the electrostatic buildup. In non-conductive fluids this charge can build and accumulate even when the system is grounded and bonded. If static charge is generated more quickly than it can be taken away, there is potential for static discharge. If this charge discharges as a spark it can lead to a number of problems in terms of process manufacture, ranging from pitting of the vessel to explosion.

Electrostatic Charge

The electrostatic hazards of liquids are not always well understood. An electrostatic charge can build up within a liquid, particularly those with low conductivity such as hydrocarbons. Even with the pipe or vessel being earthed, a charge can remain within the liquid for a period of time.[1,2] Accumulated charge can also give rise to electrostatic discharges from the liquid surface that are sufficiently energetic to ignite a flammable atmosphere. This flammable atmosphere may be evolved from the liquid itself if the liquid is flammable or combustible and it is above its flash point temperature, or in the form of a spray or mist.

Electrostatic charge is generated when two dissimilar surfaces - such as the liquid and the walls of the vessel or piping

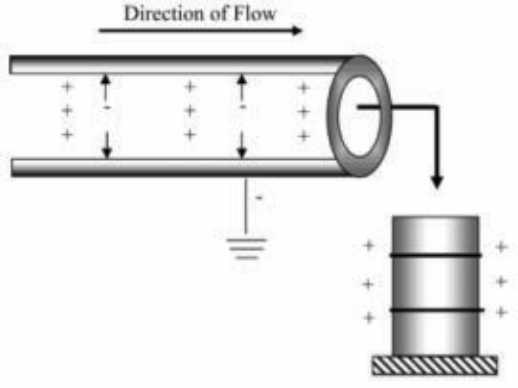

Figure 1. The generation of static due to the flow of liquids.

Liquid	Conductivity (pS/m)	Relaxation Times Constant (s)
Conductive Liquids	**(>10,000 pS/m)**	
Ethyl Alcohol (25 °C)	1.35×10^{5}	1.6×10^{-3}
Isopropyl Alcohol (25 °C)	3.5×10^{8}	5×10^{-7}
Water, distilled	$\sim 1 \times 10^{9}$	7.1×10^{-4}
Semi-Conductive Liquids	**($100\text{-}10^{4}$ pS/m)**	
Methylene Chloride	4300	1.8×10^{-2}
Pentachloroethane	100	0.3
Non-Conductive Liquids	**(<50 pS/m)**	
Heptane	3×10^{-2}	~100
Hexane	1×10^{-5}	~100
Toluene	<1	21
Xylene	0.1	~100

Table 1. Conductivity and relaxation times for selected liquids.[2]

- come into contact. The greater the area of the interface between the liquid and the surfaces and the higher the flow velocity, the greater is the rate of charging. The charge is carried with the liquid to the receiving vessels where it can accumulate (Figure 1). The electrical properties of the solvents play a major role in determining both charge generation and relaxation. Static electric charge on a liquid in a grounded conductive container will dissipate at a rate that depends on the conductivity of the liquid.[2]

Conductivity

The conductivity of a liquid affects its charging ability and it is expressed in terms of siemens per meter (S/m) or more commonly picosiemens per meter (pS/m). According to NFPA-77, the U.S. consensus practice on static electricity, liquids can be divided into three classes: conductive (>10,000 pS/m), semi-conductive (50-10,000 pS/m) and non-conductive (<50 pS/m) (Table 1). For conductive liquids any static generated within the liquid can be conducted to the pipe/vessel and be dissipated safely via the grounding. For semi-conductive liquids, the rate of charge generation is critical, i.e., when charge generation is rapid, there may not be time for the charge to be dissipated. Low conductivity liquids are unable to dissipate the static charge. Static buildup can occur even if the vessel is earthed. Conductivity is a function of temperature; hence the conductivity of a liquid will be lower when it is cold. Therefore, it is important in a manufacturing process to measure the conductivity of a solvent when it is at its lowest temperature.

Prevention of Static Build-Up

All conductive equipment associated with processing of flammable liquids should be grounded in order to prevent the accumulation of static charge. Limiting the liquid velocity during vessel and container filling operations helps to limit electrostatic charge increase. In pipes, buildup of static is limited by reducing flow velocity. The recommended maximum flow for a low conductivity solvent is 1m/s when a solid or second liquid could be present. When this is not the case, a maximum limit of 7m/s is suggested.[3]

Increasing Conductivity

The electrostatic hazard posed by non-conductive liquids such as hydrocarbons, aromatic solvents, and insulating oils to name but a few, can be decreased dramatically by increasing their electrical conductivity. The conductivity of an insulating liquid can be increased by addition of an antistatic additive. The increased conductivity enables charge to be more readily dissipated from the liquid. The use of antistatic additives, also known as conductivity improvers, to render a solvent 'conductive' and enable static electric charge dissipation is becoming a recognised practice particularly in the solvents and coatings industries and is described in the industry guidelines.[2-5] Static dissipater additives increase the conductivity of solvents to render them conductive (>10,000 pS/m), and mitigate the build of static charge and its resulting consequences.

One example is the application of Statsafe™ from Innospec which has the advantage of very low dose rates, requiring the addition of only a few parts-per-million (ppm). Statsafe increases the conductivity of an insulating liquid by several orders of magnitude and is also available in a food contact approved version. The low treat rates offer a cost effective solution to static electricity in fluids, when used in conjunction with appropriate grounding of equipment, for use in solvents, and coatings applications.

Handheld conductivity meters allow the conductivity to quickly and easily be checked to ensure target conductivity continues to be maintained after a period of time or downstream in the process. This conductivity consideration gives an extra layer of protection against static electricity, helping to keep the plant, people, processes and business safe, and also helping to achieve ATEX compliance.

ATEX 137/ DSEAR

Where flammable and potentially explosive atmospheres exist, the ATEX 137 European directive, implemented as DSEAR in the UK, places a mandatory obligation on employers to: "consider and eliminate possible sources of static electricity".[6,7] One source that is often overlooked is the flammable liquid itself. Use of best handling practices in conjunction with anti-static additives can be effective at minimizing the risks associated with generation of static electricity in moving liquids.

Conclusion

The role of conductivity in static generation of flammable liquids is often overlooked. The conductivity of a liquid determines the rate at which generated static can be dissipated via grounding. Rendering a liquid 'conductive' with a conductivity of >10,000 pS/m by the use of an antistatic agent reduces electrostatic hazards in a variety of applications. This is a cost effective solution to reduce the risk of static discharge and fire, and also helps to achieve ATEX compliance when used in conjunction with other safety methods such as appropriate grounding of equipment and reduced flow rates.

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Grieve Releases New 850°F Cabinet Oven

No. 934 is an 850°F (454°C), cabinet oven from Grieve, currently used for heat treating at the customer's facility. Workspace dimensions of this oven measure 38" W x 20" D x 26" H. 10 KW are installed in Incoloy sheathed tubular heating elements, while a 600 CFM, 1/2-HP recirculating blower provides horizontal airflow to the workload.

This Grieve cabinet oven has 6" insulated walls, an aluminized steel exterior and Type 430 stainless steel interior.

Controls on the No. 934 include a digital indicating temperature controller, 10" diameter circular chart recorder and SCR power controller.

photo caption

Union Process Builds Multi-Tank Lab Attritor System

Union Process, Inc. manufactured a custom multi-tank lab Attritor System for grinding metal powders and advanced ceramics.

The Attritor System includes usage of up to six grinding tanks, with six agitator assemblies all in a single unit, allowing for maximum versatility. The single point of control makes the system consistent and easy to use.

This unique system provides the opportunity to accomplish multiple test batches under the same lab conditions. A timing belt assures that all connected Attritor shafts run at the same speed for the same period of time. A support column allows the customer to raise or lower the tank. This particular system was designed with MECO shaft seals so the customer could grind under inert gas.

Powered by a 3 HP, TEFC, explosion-proof motor, the system uses a variable frequency (inverter) drive installed in a wash-down duty enclosure mounted remotely. On the machine, there is a stop/start switch with a potentiometer for controlling the speed.

Customers may choose standard stainless-steel tanks, or for a metal-free system, tanks can be constructed from alumina, zirconia, or Tefzel.

allnex Launches Saturated Polyester Resin System

allnex launched CRYLCOAT 1738-2. CRYLCOAT 1738-2 is a versatile saturated polyester resin system, designed for use on items such as metal furniture or light fixtures. When formulated into high gloss coatings, CRYLCOAT 1738-2 exhibits excellent overbake resistance, boiling water and acid resistance.

Additionally, CRYLCOAT 1738-2 can easily be formulated into low gloss coatings using matting hardeners to achieve gloss levels of 30 percent.

Features of the CRYLCOAT 1738-2 include easy to obtain full gloss range, easy to achieve structure or textured finish, excellent mechanical properties, excellent storage stability and overbake stabilized.

EPS/CCA Launches New Line of Low VOC Colorants

Engineered Polymer Solutions and Color Corporation of America launched NovoColor Superfine waterborne dispersions for in-plant tinting of coatings and stains where a high degree of color transparency is desired.

NovoColor SF colorants are controlled to stringent color and opacity standards and give the user batch to batch appearance uniformity.

Key features of NovoColor SF include high transparency, non-resinous, ethylene and propylene glycol free, excellent lightfastness and durability and outstanding compatibility in a wide range of waterborne coating systems, including acrylic emulsion and water-reducible alkyd stains.

These low VOC colorants offer a wide range of pigment choices to meet coating systems requirements for durability, chemical resistance and color space.

NovoColor SF colorants were developed for use in a variety of architectural and industrial coatings formulations, as well as wood stains, concrete stains, deco foil, inks and glass coatings.

Croda Announces New 100% Bio-Based Surfactants

Croda International Plc announced the official launch and certification of its ECO range of bio-based surfactants, ingredients designed to meet increasing market demand for sustainable, high-performance ingredient options.

The new 100 percent bio-based and 100 percent renewable range of non-ionic surfactants are the widest commercially available and is certified to meet the criteria of the USDA BioPreferred program.

The new ECO range is the result of a significant investment made by Croda in its Atlas Point manufacturing site in New Castle, Delaware to construct an ethylene oxide plant using naturally derived feedstocks.

According to the company, the range offers a wide variety of benefits including emulsification, detergency and cleansing, and solubilization while delivering mild and stable formulations. ***CW***

Benjamin Moore & Co. Appoints Dan Calkins Chairman, CEO

Benjamin Moore & Co. President and COO Dan Calkins was promoted to chairman and CEO, succeeding Mike Searles.

Calkins began working at Benjamin Moore in 1987 as a sales trainee.


Calkins

"Benjamin Moore & Co. has long established itself as an industry leader, and under Dan Calkins' guidance, we believe they are primed for an accelerated trajectory into the future," said Greg Abel, Berkshire Hathaway vice chairman. "Dan embodies the Benjamin Moore core values and both his proven track record and strong business acumen give us incredible confidence for the company's future success."

Azelis Americas Adds Two in Organizational Change

Azelis Americas hired David Jackson and Bill Wallace as VP of rubber and plastics additives and VP of the candle business/VP of principal development, respectively.

Jackson previously ran the RPA business for Azelis Canada. Prior to joining Azelis, Wallace was EVP, sales Americas for the additives business unit of Lanxess AG.

His primary focus will be on sustaining the growth in the candle market. Additionally, he will assist in managing relationships with key principals.

Siltech Adds Four to Sales Team

Siltech Corporation added four sales managers to its international and U.S. sales team.

Brian Allen joined Siltech as global marketing and sales manager, personal care. He worked at Wacker Chemical Corporation in Adrian, Michigan, for over 13 years, most recently as performance siliconessales director for North and Central America.

Mike Gunther joined Siltech as U.S. southeast sales manager, industrial silicones. He was most recently international business manager at Shin-Etsu Silicones of America Inc.

Daniel Aranda joined Siltech as U.S. south sales manager, industrial silicones. He was most recently a global key account manager at Omnova Solutions – oil and gas.

Mario Kaufer joined Siltech as sales manager, personal care covering Germany, Austria, Slovakia, Czech Republic, and Poland. He worked for ten years at Dow Corning as key account, distribution & business development management, electronics, solar & lighting.

Frank Magdits Joins Aakash Chemicals

Frank Magdits joined Aakash Chemicals and Dye-Stuffs (Glendale Heights, Illinois) as business development manager – pigment dispersions.

In this role, he will be responsible for establishing the pigment dispersion business unit and driving growth within the CASE, inks and plastics segments.


Magdits

Before joining Aakash Chemicals, Magdits was VP of sales and marketing at Pan Technology, Inc.

He currently serves as VP on the Executive Board of the Metropolitan New York Coatings Associationand on the Alumni Advisory Board at Ramapo College of NJ's school of Theoretical and Applied Sciences.

Sauereisen Promotes Mark Golla to VP–Sales

Sauereisen, Inc., promoted Mark Golla to VP sales. In his new role, Golla will continue overseeing the promotion of Sauereisen, as well as work with the executive team to develop strategies to move the company forward.

"It is an honor and a privilege to announce Mark's promotion," said company president J. Eric Sauereisen. "It reflects his attitude, initiative and certainly his successes within our company and with our customers."

Since 2014, Golla has served as sales director for Sauereisen. He previously held positions at Saint-Gobain Abrasives, Saint-Gobain Ceramics and Plastics, Schott Glass Technologies and Harbison Walker Refractories.

Michael Finn Steps Down as Axalta's General Counsel

Axalta's SVP, General Counsel and Corporate/Government Affairs and Corporate Secretary Michael Finn decided to step down to pursue another professional opportunity, the company announced.

Tabitha Oman, VP, deputy general counsel and chief compliance officer will serve as interim general counsel.

Finn officially left the company before the end of 2018 but will continue to consult for Axalta. He served as Axalta's general counsel since joining the company in 2013.

"Michael's innumerable contributions go far beyond the global leadership of our legal and compliance functions, as he has been invaluable in establishing Axalta as a standalone public company, supporting our board, leading many significant transactions, and managing complex litigation and regulatory matters," Axalta CEO Robert Bryant said.

"Serving as Axalta's General Counsel has been enormously rewarding both professionally and personally, and stepping down was a difficult decision. I am extremely proud of what we have accomplished as a team during my time with the company, and I very much look forward to watching Axalta reach new heights in the future," Finn said. ***CW***

European Coatings Show Runs March 19-21 in Nuremburg

March 4-6
Pakistan 2019 Coatings Show
Location: Pakistan
Venue: International Expo Center Lahore
Contact: organizer@pcs-online.pk
Phone: +92-42-36296901-5
Website: www.pcs-online.pk

March 19-21, 2019
BIG IDEAS for UV+EB Technology
Location: Redondo Beach, California
Phone: 240-497-1242
Website: www.bigideasconference.com/

March 19-21, 2019
European Coatings Show and Conference 2019
Location: Nuremberg, Germany
Venue: Nurnberg Messe
Contact: Vincent Network
Phone: +49 9 11 86 06-81 07
Website: www.european-coatings-show.com

March 19-22, 2019
EPCEd: Scale-up and Commercial Production of Emulsion Polymers
Location: San Diego, CA
Contact: Info@epced.com
Phone: 603-742-3370
Website: www.epced.com/wsscaleup.html

April 1-4, 2019
Powder Coating 2019
Location: Orlando, FL
Venue: Renaissance Orlando at SeaWorld
Contact: kelly@goyermgt.com
Phone: 859-525-9988

April 8-10, 2019
2019 CoatingsTech Conference
Location: Cleveland, Ohio
Venue: Westin Cleveland Downtown
Phone: 202-462-6272

April 14-17, 2019
Southern Society for Coatings Technology Annual Meeting
Location: Charleston, SC
Venue: Charleston Marriott
Email: ssctorg@gmail.com
Website: www.ssct.org

April 15-17, 2019
EPCEd: Hybrid Latex Systems – PU, Alkyd and Inorganic/Acrylic Latexes
Location: Savannah, GA
Contact: Info@epced.com
Phone: 603-742-3370
Website: www.epced.com

April 16-17, 2019
Windy City Coatings Course 2019
Location: Chicago, IL
Venue: Holiday Inn O'Hare
Contact: chicagocoatingssociety@gmail.com
Website: www.windycitycoatings.com

May 13-15, 2019
Eastern Coatings Show 2019
Location: Atlantic City, NJ
Venue: Harrah's Resort & Casino
Phone: 718-705-4561
Email: dlugo@gae-llc.com

Sept. 18.-20, 2019
CEPE Annual Conference + General Assembly
Location: St. Julian's, Malta
Phone: +49 511 99 10 281
Website: www.european-coatings.com

Oct. 1-3, 2019
ABRAFATI 2019
Location: Sao Paulo, Brazil
Venue: São Paulo Expo Exhibition & Convention Center
Phone: 55 11 4083 0504/ 0505
Email: abrafati.2019@abrafati.com.br
Website: www.abrafati2019.com.br/

Oct. 20-23, 2019
The 34th Biennial Western Coatings Symposium and Show
Location: Las Vegas, NV
Venue: Paris Hotel
Phone: 714-974-4511
Email: westerncoatings@earthlink.net
Website: www.westerncoatings.org

Nov. 5-8, 2019
SEMA Show
Location: Las Vegas, NV
Venue: Las Vegas Convention Center
Email: semashow@sema.org
Website: www.semashow.com

Nov. 18-20, 2019
CHINACOAT 2019
Location: Shanghai, China
Venue: Shanghai New International Expo Centre
Website: www.chinacoat.net

Nov. 20-22, 2019
Greenbuild International Conference and Expo 2019
Location: Atlanta, GA
Venue: Georgia World Congress Center
Email: info@greenbuildexpo.com
Website: www.greenbuildexpo.com

2020

March 31-April 2, 2020
American Coatings Show
Location: Indianapolis, IN
Venue: Indiana Convention Center
Website: www.american-coatings-show.com

May 19-21, 2020
UTECH North America 2020
Location: Chicago, IL
Venue: Renaissance Schaumburg Convention Center Hotel
Email: dhershfield@crain.com
Website: www.utech-north-america.com

CW

Blades

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Arkema Coating Resins	25	www.arkemacoatingresins.com
Azelis Americas	11	www.azelis.com/americas
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Vincentz Network GmbH & Co. KG	21	www.european-coatings.com
Wanhua Chemical Group Co.Ltd.	3	www.whchem.com/en/

Turkish Town Transformed by AkzoNobel

Color is helping to transform the lives of hundreds of people in a coastal town in Turkey, thanks to a major community project being carried out by AkzoNobel's Marshall paint brand.

More than 400 homes are being revitalized in the town of Kuşadası on Turkey's western Aegean coast as part of the company's global "Let's Colour" program. Now in its final phase, the project is focused on brightening up homes in the Tepe neighborhood. Perched high up on a hill, the neighborhood was chosen for its high visibility. As well as helping to improve the lives of the 2,000 Tepe residents, the colorful makeover is also starting to attract curious visitors.

More than 400 homes are being revitalized using AkzoNobel's Marshall paint brand.

"We're delighted that our passion for paint is helping to uplift local communities and create happy homes in and around Kuşadası," said Rainer Schmidt, global director of Consumer Marketing for AkzoNobel Decorative Paints. "It makes us really proud when we see the difference our products can make."

Carried out in partnership with the local community, the Venuart Group and the Kuşadası municipality, the ongoing project involves using more than 50,000 liters of Marshall paint and is the biggest "Let's Colour" activity to be staged in Turkey so far.

Using more than 50,000 liters of Marshall paint, this is the biggest "Let's Colour" activity to be staged in Turkey so far.

Commenting on the transformation of the town, Kuşadası Mayor Özer Kayalı said: "This is a crucial location for us, as it's the first place seen by tourists when they arrive at Kuşadası port. It makes for a striking panorama, which is why we believe this project will make a great contribution to our community. On behalf of all the people of Kuşadası, I would like to extend our gratitude to Marshall and Venuart for bringing the 'Let's Colour' project to our town."

The transformation of the Tepe neighborhood is Marshall's seventh project under the "Let's Colour" banner since the program first became active in Turkey in 2010. And its colorful streets are bringing a new sense of community to the energized residents.

"We're really proud that we can change people and the way they perceive the world through paint," said Marshall's Marketing Manager Pınar Adabağ. "It's great to see how we can make living spaces more social, pleasurable and habitable while also inspiring and motivating people through the use of color."

During the first phase of the Kuşadası project, 177 homes were painted with Marshall Weathershield exterior paint, Akrikor, which is resistant to weather conditions in all seasons. The work on the remaining homes is scheduled to be completed by April 2019. It will bring the total amount of paint used for the company's "Let's Colour" projects to well over 1.3 million liters.

Nearly 2,300 "Let's Colour" projects have been completed around the world to date, involving more than 12,000 volunteers and benefiting more than 81 million people. ***CW***

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