“Green is, however, no longer a trend but an established way of doing business for the industry, and there has been a significant shift from a focus only on air quality to an approach that encompasses all aspects of processes and products that contribute to sustainability.”

Although the paint and coatings industry is focused on innovation and being “green,” there still remains a lack of agreement on the definition of a green coating. As a result, perceptions are as diverse as types of end users, and often not consistent within each group. In addition, the coatings industry appears to be ahead of customer expectations in the consideration of environmental impacts of both processes and products. Cost and performance continue to be key drivers of purchasing decisions, and green products are only considered if they provide added value commensurate with any cost premium. Green is, however, no longer a trend but an established way of doing business for the industry, and there has been a significant shift from a focus only on air quality to an approach that encompasses all aspects of processes and products that contribute to sustainability.

WHAT DOES IT MEAN TO BE GREEN?

It has always been difficult to find a universal definition of green, according to Larry Schniders, technical product manager, Lubrizol Performance Coatings. “To some customers it could mean a smaller carbon footprint, while to others it could mean low VOC content, high renewable content, or something else entirely,” he says.

Sustainability across the entire life cycle of a product is a viewpoint that is gaining traction, according to Richard Stewart, OMNOVA Solutions’ coating resins market manager for the Americas. Different customer perceptions arise in different segments due to three main factors. “Current regulatory pressures, including the cost of noncompliance; the length of time each segment has been exposed to the green coating concept; and how much value differentiation coating manufacturers can achieve by positioning their products as green,” states Eric Dumain, global business development manager, Arkema Coating Resins.

Green coatings have been on the market for a long time in the architectural segment due to increasing government regulations, and Dumain believes that water-based, ultra-low-VOC coatings are now essentially the industry norm and viewed by customers as just as good as legacy products. On the other hand, field-applied protective coating products, which have received less direct attention at the consumer and government levels, lag in customer perceptions of the benefits of being green. “Customers that use industrial products tend to care much more about performance and barrier properties because product failures carry more risk,” Dumain observes.

There are differences within segments as well, including the architectural sector. Many coating manufacturers note, for example,
that there are different expectations among different customer groups. DIY painters expect paint to be safe to use and devoid of persistent, offensive odors, while professional painters involved in commercial building are concerned with meeting LEED requirements, according to Russ Neale, director of product innovation at Valspar. Even among consumers, perceptions and understanding vary widely, and generally volatile organic compounds (VOCs) are not well understood, but Benjamin Moore’s vice president of product development Glenn Cooper comments that consumers are more astute regarding the possible effects of chemicals in the home environment.

In addition, says Robert Wendoll, director of environmental affairs with Dunn-Edwards Corporation, “retail consumers are divided between those who think green coatings are ‘safer’ or ‘healthier’ than other coatings, and those who think green is just a marketing gimmick without real substance.” He also notes that many painting contractors tend to equate green coatings with VOC-compliant coatings, and some have lingering doubts that low-VOC coatings can perform as well as higher-VOC conventional coatings. On the other hand, architects, specifiers, and designers have generally bought into the concept of green coatings, but are often not concerned with anything beyond LEED criteria.

Even with all of these differences within and between coating markets, there has clearly been a change within many industries since the green movement began, as well as realization within the broader society that our actions affect the global environment, according to Anne Shim, technical and quality director for BASF Coatings Solutions NA. There are, however, still questions about how the impacts of raw materials and coating products should be measured. If, for example, an oil-based chemical is replaced with a renewable-based chemical, is it better for the environment? Her answer: that depends on the energy footprint it takes to make the renewable-based chemical relative to the oil-based chemical, and it also depends on how the renewable process impacts other uses of the same resources. “It is very important to BASF and the industry that all of these considerations be accounted for to ensure that we truly make the right choice for a sustainable future,” Shim asserts.

How has the industry managed with all of the uncertainty related to being green? More or less all the leading coatings manufacturers have sustainability manifested in their corporate values and strategies and have implemented teams to steer the process toward more ecological solutions, from sourcing of raw materials to the development of new products and the optimization of manufacturing processes. At the same time, raw material suppliers are mainly focusing on the use of renewable raw materials, products without hazardous labeling, and energy efficiency across the value chain, according to Thomas Metz, head of global technical marketing for the coating business of Clariant. He stresses, however, that ingredients for green coatings must have the same performance as the current solution at a comparable price level. “As a result, the availability of technically and commercially balanced products is the key to success today,” he asserts.

**COST AND PERFORMANCE COME FIRST**

While nearly everyone across the coatings value chain, including end users, agrees that environmentally friendly products are desirable, there is a disconnect when it comes to paying for a more sustainable profile, according to Torrey A. Adams, business development manager for coatings and polymers with Croda. “If current coating solutions are working for their customers and there is no regulatory drive to switch, then most end users will stick with that current technology.” Cost is a crucial factor, but many also have concerns about the long-term availability of greener or more sustainable materials—they want a guarantee that the new products will be available for the expected lifetime of the products for which they will be used, he explains.

In industrial segments, adds Schnieders, products are specified based on the performance level that they achieve. Therefore, as green products are developed, they need to meet, or surpass, performance levels without adding cost. That can be an issue, because green products may be perceived as having the same, or worse, performance than other products while costing more. “In some cases this perception is true, but there are also examples of green products that meet the most demanding performance requirements. The main lesson here is that marketing should communicate the performance
benefit first with the green characteristics offered as an additional benefit,” he says.

Interviews conducted by The ChemQuest Group for the recent ACA Industry Market Analysis, 9th Edition (2014–2019) were quite revealing with respect to the demand for green coatings, according to Susan M. Anderson, a director with the consulting firm. “A large number of respondents explicitly stated that they had invested in green technologies only to be stuck by lack of interest in paying. All products must have value related somehow to financial results, be it reduction in paperwork (regulations) or cost, process efficiency (manufacturing or sales), performance improvement, etc., in order to be considered viable. Green isn’t sufficient and is only a selling point if the product is offered at the same or lower cost or provides at least equal if not better performance. The old adage ‘build it and they will come’ does not apply here,” she states.

The conclusion, adds George R. Pilcher, a vice president with The ChemQuest Group, is that green attributes are rarely used to justify the purchase of a product. He also notes that even in areas where regulations tend to be the strictest, the adoption of products that go beyond the requirements is limited. As an example, Pilcher points to the use of zero-VOC interior paints in the South Coast Air Quality Management District (SCAQMD in Southern California), which generally has the most stringent VOC limits. “Perhaps 30–40% of interior paints sold in the SCAQMD area are zero-VOC (which actually means < 10 g/L VOC). In the rest of the country, that number is much lower at 5–15%.” He further notes that the recession has had an impact on the sales of premium paint products, many of which are the greener offerings. “Consumers that paid premium prices before the recession switched to mid-priced products during the recession, and most have not switched back because they are finding the performance acceptable for the price,” Pilcher explains. That trend is having a negative impact on the sales of greener paints, with fewer customers that used to be willing to pay a premium for lower-VOC paints (which they interpret as having low odor) now willing to pay those higher prices.

In general, Julie O. Vaughn, vice president of marketing and business development for Emerald Performance Materials, agrees that although there has been significant innovation in recent years surrounding green paints and coatings with manufacturers continuing to reformulate and shift to greener technologies, end users still tend to be slow to adapt to changes, due to economic barriers and the long lead times for new technology approvals. “Basically,” adds Wendoll, “the industry is way ahead of customer expectations in making green coatings available.”

There Are Customer Expectations, Though . . .

Although cost is often a barrier to adoption of greener coatings technologies, many in the industry argue that their customers—including coatings formulators, industrial end users, and contractors and consumers in the architectural segment—are interested in and increasingly coming to expect paints and coatings that are more environmentally responsible. The clear example, according to Marc B. Goldfinger, a research manager with Axalta Coating Systems, is the switch to waterborne, high solids, and powder coatings for industrial OEM applications. He also notes that there is real demand for products that help manufacturers reduce energy consumption by requiring shorter bake times and lower curing temperatures. There has, in fact, been significant pressure from manufacturers on suppliers to make raw materials greener and more benign without compromising performance. “While there are often increased costs initially and formulating complexities, those costs moderate with competition and formulators simply adapt to a different cupboard of ingredients,” states Cooper.

“We have definitely seen an increase in market demand for greener solutions, but today’s consumers expect a product that balances a safer and more environmentally friendly profile with optimized performance and economy,” says Vaughn. She also notes that demand for products with “zero-VOC” or “low-VOC” labels has continued to grow, partly due to increasing regulations, but also partly due to certification programs such as the U.S. Green Building Council’s LEED v4 and AgBB in Germany. “These products are less and less frequently seen as an alternative as more consumers consider low VOC a primary buying factor, alongside superior performance and low cost,” she states. There were initially performance challenges with low-VOC formulations, such as microfoam, blocking, compatibility, freeze/thaw resistance, open time, tack, dirt pickup, scrub resistance, and more, but Vaughn believes there is a much greater range of available technologies today that help formulators improve the performance of paints and coatings while also meeting regulations and consumer demand for a small environmental footprint. She points to new generations of low/zero-VOC products, high-performing coalescents, pigment
dispersions, resins, reactive modifiers, tougheners, defoamers, and others, some of which may also incorporate biorenewable feedstocks such as plant-derived oils, fatty acids, and esters, or may avoid particular substances of increasing concern (formaldehyde, APE, bisphenol A, phthalates, etc.).

“With greater numbers of governing bodies and agencies implementing structure around the green principles, there are opportunities to create best practices, to better understand all the levers impacting the green movement, and to share the knowledge the industry has gained about the positive impact a green footprint can have,” says Sylvia Insogna, North America marketing director for Dow Coating Materials.

Self-accountability and consumer preferences have also become more significant drivers for rapid change, according to Michael T. Venturini, global marketing manager for coatings with Sun Chemical Performance Pigments. “Green technologies are becoming mainstream products, and are more quantifiable today than they were several years ago with both increased adherence to international recognized standards and third-party certifications. The metrics are allowing customers to verify that real benefits are being achieved while also considering the entire manufacturing process from basic chemicals to painted parts,” he says. The trend toward mainstream products is reflected in the move away from separate brands for green alternatives to integration into product lines, with environmental benefits as an expected set of features, according to Neale. As another example, Stewart notes that conformity with environmental labels is a requirement being demanded by almost all “big box” retailers.

REAL INVESTMENTS IN GREEN AND SUSTAINABLE SOLUTIONS

Despite the slow adoption by many end users of greener paint solutions, Wendoll notes that nearly all research and development efforts in the coatings industry today at a minimum consider the potential environmental impacts of product and process developments and are consequently geared to some level of environmental goals. At Clariant, for example, sustainability is now considered in

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the research and development of new products, and innovation projects are evaluated and ranked according to their ecological impact, according to Metz. The results, along with several other factors, determine the allocation of resources for new projects. “Green technology is becoming its own R&D objective like other key parameters, such as adhesion and durability,” agrees Venturini.

The situation is very different from the past, when innovation exclusively involved the development of novel solutions, and environmental and social impacts were secondary considerations at best. “Innovation today first and foremost means developing products within the constraints of regulation while not giving up performance, and not creating new supply chain problems—a tall order that challenges the best scientific minds,” remarks Dumain. He adds that green materials are wrapped in the umbrella of sustainability and corporate social responsibility today, green products are considered one component of acting responsibly, and suppliers throughout the supply chain must continue to invest in the most sustainable solutions.

Sustainable innovation is, in fact, occurring at both the process and product levels. With respect to processes, companies are improving their own and developing products that can help their customers improve theirs. “Many companies have looked to improve the sustainability of operations, which will continue as manufacturers find new approaches and make new investments to slash emissions, waste, energy consumption, and water usage,” says Vaughn. Wet-on-wet processes are an ideal example of a new method that improves customer operations. Stewart points to technologies aimed at reclaiming the water used during paint reduction, the formulation of higher-solids waterborne paints to reduce water consumption in products, as well as the costs and CO₂ emissions associated with shipping latex, and improving dirt pickup resistance to reduce the need for washing and repainting, which can also help achieve water conservation goals.

Across general finishing applications (metal, wood, composites), new resin developments have enabled reduction of air emissions and hazardous waste and elimination of chemicals that may potentially harm applicators, according to David Calabra, global product director for metal and plastic with the product finishes division of The Sherwin-Williams Company. New polyurethane formulations, for example, not only provide a way for end users to meet environmental standards, but also to reduce energy consumption and inventory levels. In fact, advances in product and process environmental profiles have typically led to the need for advances in other technologies to maintain or achieve greater performance properties. Goldfinger points to the need for improvements in dispersion technology and polymer structure for waterborne systems; viscosity adjustment through polymer chemistry and formulation science for high solids solventborne coatings; and the in-depth understanding of the physical chemistry, rheology, and interfacial properties of coating systems needed to implement wet-on-wet processes.

Alternative renewable starting materials, including basic building blocks, are also being developed by small university labs, numerous startups, and large multi-nationals. “Scaling these technologies to economically compete with traditional petrochemical production methods has produced even more innovation,” observes Dumain. He goes further to note that identifying renewables that do not create their own unintended negative consequences will also be crucial as technology evolves.

“Most, if not all, of the large companies and many smaller organizations are investing resources in the development of sustainable solutions, often as part of their efforts to be good stewards and improve world conditions,” observes Adams. These companies, according to Adams, also realize that at some point in the future more sustainable solutions will be a requirement for doing business, and they want to be prepared. “Companies that aren’t investing today will be at a significant disadvantage when that day arrives,” he asserts. Cooper adds that innovation is needed to stay competitive in a greener market. “The industry has realized that green is not a fad, but continues to gain traction in the marketplace.”
SUPPLY CHAIN IMPACTS

Although there is disagreement within the industry regarding the extent of customer demand and expectations for green products and technologies, no one will argue that increasingly stringent VOC regulations have had a significant effect on the industry. “While the industry has always been focused on innovation and being green, the changing regulatory environment has served to channel research and development efforts into certain areas, particularly lowering the VOC content of paints at an accelerated pace,” Wendoll says. He adds, however, that those developments have often led to the delay of research in other areas that may ultimately prove more productive and environmentally beneficial, and at this time, technology developments are focused on fully recovering lost performance.

The need to meet those demanding regulatory requirements has also driven greater collaboration between members throughout the supply chain, according to Schnieders. “Lubrizol and formulators are finding that meeting some VOC requirements in a formulated coating requires the development of new raw materials as well as the use of novel formulating techniques. For the most stringent requirements, neither approach by itself will achieve the goal,” he says. Insogna goes even further, indicating that green is always part of the conversation with customers today, whether the discussion is about the green benefits of a formulated paint or a raw material. “As a result, green is more integrated into the value proposition of products across the value chain and through more detailed conversations, both players are trying to define how to tackle the challenges inherent in green coatings. These stronger collaborations allow us to employ tactics like life cycle assessments and work with third-party agencies to define regulations in this space,” she states.

There is also a need for suppliers to provide an unprecedented level of transparency when it comes to renewable raw materials and sustainability to demonstrate that true gains are made. “It is no longer sufficient to simply state that your products contain a renewable [material]; you need to quantify the gains/improvements it provides in the same way you would for other performance benefits,” Venturini explains.

The interaction between groups has also become far more complex and grown significantly due to the need to meet different regulatory requirements in different regions and have a thorough understanding of raw material sourcing in all of those regions. Regional production is also important because the influences of shipping and logistics can determine if true carbon energy savings are made. “In the long term, suppliers that manufacture to the highest global standards and can supply locally will be able to offer the best service and products with the smallest total environmental footprint,” comments Venturini. As a result, the entire supply chain needs to work more closely together than in the past. “Extensive communication will be needed to address a variety of factors, including raw material availability and regulatory requirements related to the country in which you manufacture, where the product is shipped, and where it will be applied,” observes Calabra. “To manage the back-and-forth process efficiently and effectively, coordination between multiple groups within a coatings manufacturer, such as technical, regulatory, purchasing, manufacturing, and logistics, and with a wide range of external partners is required.” The one constant, he notes, is that regulations continue to change and tighten, and manufacturers must continue to be flexible in their ability to address VOC concerns. “A true coatings partner should be on the leading edge of finishing trends and emerging regulations,” he observes.

Communication has, in fact, become a key factor in the successful implementation of solutions that meet regulatory needs and initiatives across
the chemical industry. “We have seen the entire industry become more open and willing to share progress and information on the latest developments and practices through article publications and presentations at conferences,” Vaughn observes. “Close working relationships will be even more important given the scale of investment that may be needed as new materials are developed and incorporated into the supply chain,” she adds. “For example, many resins and chemicals—including materials that Emerald uses and produces—are based on petrochemical feedstocks such as ethylene, propylene, butadiene, benzene, and toluene. The biobased versions of these raw materials are not currently available on the scale and at a cost suitable for industrial use; however, we stay abreast of developments with suppliers.”

Education is a particular component of communication that many suppliers feel is important when it comes to sustainability and green technologies. “As our customers become more aware of the impact on the environment that they have, it has become increasingly more important for them to learn from their suppliers, including BASF, how available solutions can help them achieve their targets,” notes Shim. Axalta Coating Systems has worked to help customers understand that there are ways to minimize the sacrifices that they may need to make in order to make environmentally responsible choices, according to Laurie Kronenberg, strategic marketing director for the company’s North America refinish business. “When consumers are faced with a trade-off between product attributes, the environment can sometime lose. Many products that require consumers to make such trade-offs have failed to establish themselves in the marketplace. We have focused on developing products that can help avoid this dilemma, such as wet-on-wet waterborne and low-VOC solventborne basecoat solutions for the collision repair industry,” she says. As a manufacturer of architectural paints, Dunn-Edwards has focused on educating consumers with regard to what Wendoll considers the single most important but often overlooked green attribute of coatings—quality performance.

SHIFT TO A BROADER FOCUS

All of the actions taken by companies within the paint and coatings supply chain, including process improvements, product innovation, investment in fundamental raw material innovation, and increased collaboration, all point to a shift in the industry perception of “green.” Initially, the focus of the green movement was on lowering VOC content, and efforts were largely driven by regulations. Programs such as LEED also considered only VOC content. That is no longer true today. “The focus is now much broader, encompassing other environmental issues such as sustainability,” says Stewart. Wendoll agrees that more attention is given to issues such as potential toxicity, recyclability and end-of-life management, resource conservation, and voluntary third-party certification programs. He also notes that consumers have infinitely more access to information, which has prompted manufacturers to continue to place an emphasis on providing safer products.

Consumer perceptions have, in fact, also shifted toward the term “sustainable” rather than “environmentally friendly,” according to Michael D. Brown, president of consulting firm StrategyMark. “While there are subtle differences, some are rather significant and important, such as the trend toward renewably sourced raw materials. Innovation has also now shifted to renewables, increased durability, and the development of multifunctional formulations (e.g., cool roofs),” he comments. Insogna has also observed that coating formulators are looking at green solutions more holistically, seeking technologies that do more than just decorate and protect and finding opportunities to switch from solventborne to waterborne technologies.

FUTURE EXPECTATIONS

Despite limited adoption of greener coating technologies except where mandated by regulations, the green movement has graduated to a focus on sustainability and is no longer considered a trend but an expectation and a requirement for doing business in the paint and coatings industry. The small set of end users who buy more sustainable products regardless of price because they believe it is the right thing to do will remain. There will also be a continued push for products that meet various green requirements, such as safer-to-use or achieving a smaller carbon footprint, but Schnieders anticipates a continued unwillingness to pay more for these products if they do not outperform other available products. On the other hand, building codes and practices that are increasingly focused on sustainability will drive additional users to harmonize the products they use, shifting them away from older products. Eventually, according to Brown, a tipping point will be reached where the economics of using “sustainable” raw materials and formulations will be close enough to parity with “non-sustainable” traditional products that mainstream customers will switch, not necessarily because of a strong buying desire for sustainability, but rather ease and availability. Adams believes that new regulations requiring the use of renewable raw materials will be needed to drive major adoption of sustainable solutions, which may come in 15 years or so.
In the meantime, there will be some level of demand for innovation driven by both regulations and customer needs, and these demands will not be seen only in mature markets, but also in emerging regions, according to Goldfinger. Further reductions in VOCs and hazardous substances (zinc phosphate, tin, cobalt driers, etc.) will occur. Greener substrates will also be introduced that will reduce the amount of coating required and place higher performance demands on coatings, and paint manufacturers and raw material suppliers will need to develop effective solutions for these new materials. “Formulators will face challenges as they work to meet these future needs, but these same challenges present opportunities to innovate and improve the quality of our coatings and lower process times for customers,” Calabra observes. In addition, as the availability of sustainable alternatives for feedstocks and materials increases and new successes in innovation are achieved, the cost for certain technologies may become more competitive, according to Vaughn. One key area of interest for Stewart is future access to cost-competitive bio-based raw materials for the production of acrylic resins.

Life Cycle Analysis tools will also hopefully become commonplace, so that members within the supply chain can see how their products stack up, not only with respect to upfront green material profiles, but over the products’ entire lifetimes (the cradle-to-grave approach), according to Dumain. He also expects to see more emphasis on reusability and recycling of raw materials and coatings. Benjamin Moore sees the green movement as progressing through three phases, which began with the removal of undesirable ingredients, then graduated to process improvement with reduction of overall environmental footprints. Now, it is progressing to the development of coatings that do more than protect and beautify, such as provide microbial management and other functionality, according to Neale. As a result, Insogna believes that the continued focus on incorporating green technologies into coatings will cause broadening of paint categories—with growth of added functionality, improved environmental footprint, and improved EH&S benefits. “We already see this type of innovation happening with technologies that are better for the environment by drastically reducing TiO₂, better for consumers by improving indoor air quality, and safer for application by removing certain chemicals from the manufacturing process,” she asserts.

Regardless of how the sustainability movement proceeds, Wendoll stresses that manufacturers in the paint and coatings industry were never passive bystanders in the green movement. “We have a long history of developing coatings that are safer for humans and the environment. In the years to come, I think we will actually see a reversal in influence; the question should really be: How will the paint and coatings industry influence the green trend in coming years? In short, I expect to see much greater understanding of the importance of coating performance in conserving energy and material resources and promoting a healthier, more satisfying built environment for people to live and thrive in,” he concludes.