



SUSTAINABILITY

in Paints and Coatings — Making it *Real World*



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Sustainability is not a new idea. Deal with it.

Truth is, the concept of sustainability has been around for quite a while now. In one form or another, humans have long been practicing sustainable technologies for altruistic as well as self-centered reasons. Over 1,000 years ago, the Sinagua, northern cousins of the Hohokam Indians, would bury leftover fish parts in holes and then plant several seeds of maize on top. The recycled content provided for a larger crop and eliminated an undesirable and often fragrant waste stream. Looking more myopically to the recent past and specifically to coatings, one needs to look no further than the use of lead in paints for an example of what can be achieved with a little focus on sustainability. Lead was determined to be responsible for behavioral problems, learning disabilities, seizures, and even death. Since a common route of entry for children was the ingestion of paint flakes, the industry stepped up and eliminated lead in architectural and industrial paints.

Perhaps sustainability is not a new idea, but recently it has become more well-defined. Most schools of thought now look at sustainability in terms of meeting the needs of the present without compromising the ability of future generations to

Table 1—Several Industry Drivers for Sustainability

Industry Driver	Comment
VOC compliance	Ultra-low to near-zero VOC options favor waterborne and 100% solids technologies
Environmentally preferred content	Preferences and trends of the industry shape choices
Renewable materials	Natural oil polyols (NOP) from soy or castor beans
Re-usable materials	Reclaimable UV coatings used in furniture and wood manufacturing
Recycled content	Used polymer glycolysis; fillers created from waste stream
Energy efficiency contributions	Cool roof coatings; UV cure vs. oven cure; energy savings
Environmental footprint	Life-cycle analysis; environmental product declaration
Environmental performance	Certification requirements often account for durability
Locally manufactured	Local sourcing lowers carbon footprint due to shipping
End of life/downstreaming	Does the coating become part of the substrate's next life?

meet their own needs. Simply put, there are three components that make up sustainability: social, economic, and environmental. Social responsibility can include education, ethical decision making, and human rights. Economic responsibility may look at the sustainability of production sites and their optimization for long-term payback. An example of environmental responsibility would be considering the effects of the total life cycle of a product. When all three components, also known as the triple bottom line, are optimized, sustainability is optimized.

The following is a focused discussion specific to sustainability as it relates to the paint and coatings world. You will see that the triple bottom line plays an integral part in positioning a product for success in the green marketplace. A marketer of a green product can address a single driver with less emphasis on sustainable growth in the hope of appealing to the perception of the buyer. Or the marketer can address multiple drivers to “position the product in the mind of the prospect.”¹ Hopefully you will finish this article with the understanding that sustainability is not something to be put up by itself on the top of a pedestal and pointed at. Rather, sustainability should be woven into how you do everyday business.

INDUSTRY DRIVERS FOR SUSTAINABILITY

In the paint and coatings market, there are many drivers that can affect a product or technology's suitability as a “green” solution. *Table 1* summarizes some of these drivers and presents several comments as the driver relates to paint

and coatings. These drivers can be loosely grouped into three categories: preferred content, legislation, and certification drivers.

Preferred Content Drivers

For preferred content drivers, there are current trends in regulation that are governing the use of VOCs or other additives. One example might be the downward trend for VOC content in most districts such as SCAQD, CARB, OTC, and the EPA. This trend is expected to continue, and therefore formulators are anticipating tighter guidelines. Many of these tighter guidelines already exist on the West Coast and just as the winds in this country blow west to east, so do the lower VOC guidelines. Historically, once SCAQD or CARB adopts tighter standards, the other districts soon follow. Other trends to consider are the use of phthalates and bisphenol A in a variety of coatings, paints, and plastics. For lower VOC trends, being ahead of the curve gives the formulator an economic advantage in an area that continues to grow.

Legislation Drivers

Legislation drivers deal with governmental drivers that are already in place. Perhaps one of the most widely recognized successes is the EPA's Energy Star program. The blue and white emblem is emblazoned on common items such as refrigerators and computers but has important purposes in the built environment as well. Many buildings today are being built with cool roof systems such as IR reflective coatings. This technology reduces energy consumption and reduces CO₂ emissions in addition to saving money.



Additional governmental drivers in place include the USDA's BioPreferred program, which aims to increase the purchase and use of bio-based products; and California Title 24, which also favors cool roof technologies.

Certification Drivers

Certification drivers often include all of the drivers from the other two categories as well as additional drivers. There are a host of third-party certification programs that take many coating environmental drivers into account. These organizations, which include LEED, Green Seal, Green Guard, and Green Globe, have developed templates that document many parameters involved in the decision and ranking process. Some of these rankings include whether a product is manufactured locally or if a life-cycle analysis (LCA) has been completed. Considerations for end-of-life and downstreaming are factored in along with the more common triggers such as VOC content, indoor emissions, recycled or renewable content, and energy efficiency contributions.

These certification programs are a viable solution for a large group of individuals—those in the architect, engineer, and professional design communities. This group has led the industry by demanding sustainability and a sustainability ranking for the products they specify.

SUSTAINABLE COATINGS CHEMISTRY AND USES

There are dozens of coatings chemistries that offer green solutions for a variety of final uses such

as OEM parts, plastics, concrete, and steel. The following three examples highlight a few of these sustainable chemistries, why they are uniquely positioned to aid the architect, designer, or specifier in their endeavors, and some examples where these technologies may be used.

Natural Oil-Based Coatings

Bio-based resins can be derived from a variety of natural sources such as soy or castor beans. These resins are used where nature has provided unique structures which are technically and economically viable. While not a brand new technology, this class of resins offers significant advantages to the formulator and applicator in addition to the bio-based content. In many cases, 100% solids coatings can be formulated to be very hydrophobic, both when applied in the field as well as in the final coating film. This allows for a more rugged system when applied in higher humidity environments or in final applications routinely exposed to water. Some typical uses would include self-leveling floor coatings, secondary containment, and corrosion protection.

Waterborne Technologies

One-component and two-component coatings formulated with polyurethane dispersions have been in use for a number of years. Early waterborne coating technologies often required the user to sacrifice certain properties or processing when compared to traditional solventborne coatings. In addition, many of the early waterborne coatings technologies still contained over 250 g/L of co-solvent. Newer, second-generation commercial systems are now primarily waterborne and have as little as 0–15 g/L of VOC and no co-solvent. Additionally, many of these waterborne coatings meet or exceed the physical and chemical resistance properties of the solventborne coatings, which make them a viable replacement product. These coatings systems are finding their way into a number of end-use markets such as graffiti resistant coatings, architectural and floor coatings, cool roof applications, and corrosion protection.^{2,3}

Next Generation High-Performance Resins

Novel coating chemistries continue to evolve and address new environmental as well as application challenges. In addition to the many sustainability challenges for coatings outlined previously, the market is asking for extra enhancements. These enhancements include better long-term durability, faster return-to-service times, and higher film build per coat. For example, polyaspartic resins allow for the formulation of near-zero VOC concrete floor and steel bridge coatings with a very fast cure time along with the added benefits of a

high film build and increased long-term toughness. For site-applied wood flooring or factory-applied plastic parts, 100% solids UV resins allow for rapid cure while retaining excellent physical and chemical properties. These coating technologies, along with others such as moisture-cure urethanes, allow the end user to meet tougher application needs while respecting sustainability goals.

CONCLUSION

To summarize what has been discussed:

- Sustainability should be woven into how you do business
- Focus on the drivers for sustainable coatings
- Position your product in the mind of your prospect
- Get familiar with sustainable coating technologies and their uses

Sustainability has been around in many forms and for many intentions. In the coatings world, we can choose to embrace it for several reasons: social, economic, environmental or all three. If not, as Jared Diamond writes in *Collapse: How Societies Choose to Fail or Succeed*, later generations may end up asking themselves, "Why didn't they look around, realize what they were doing, and stop before it was too late?"⁴

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