Sealants: The Nuts and Bolts

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Doug Walker and Eric Muench of Sika Corporation, a supplier of specialty chemical products and industrial materials in Lyndhurst, N.J., clearly laid out everything there is to know about using silicone, polyurethane and hybrids at the 2013 SWR Institute's Winter Technical Meeting in Scottsdale, Ariz. Walker and Muench presented, "Everything You've Always Wanted to Know About Sealants," which covered sealant technology and chemistry, sealant use and the future of sealants in the industry.

The two sealant professionals gave a comprehensive presentation that examined each technology from an expert's perspective to help shed light on what is really important in a sealant. They also detailed how the industry is changing and provided new perspectives concerning sealants.

The main takeaway that the co-presenters wanted to give the audience was that each generic sealant type (also known as chemistry or technology) has its inherent strengths and weaknesses. But today there should not be as much pressure to choose the "right" sealant by type because all present technologies can provide a great choice if selection is made from the high performance range; they suggest choosing among SWRI validated products. This is as each sealant type does have inherent qualities and disadvantages, but within the high performance class suitable for most new and renovation applications, producers have formulated products to meet a wide variety of the demanding performance requirements for commercial building weather seals.

Walker began by outlining some of the common myths people have about sealants, such as:

- Silicones don't stick to porous substrates.
- Polyurethanes last only five years.

- Non-staining silicones don't have to be tested for staining.
- Polyurethanes cannot be used with EIFS.
- Silicone is better than STP, which is better than polyurethane.
- Warranty defines the performance of the product.

Walker continued by discussing some of the common problems on-the-job workers see when using sealants, such as adhesive and cohesive failure, joint movement before cure and longer term sealants can experience UV degradation and reversion. Walker said problems like these typically occur because someone chose to use the wrong sealant for the job—not because the sealant was inherently "bad."

"The thing we want to try and help you understand is that today, because of the evolution of sealant formulation science, it's not so much the chemistry itself, the generic type of sealant, but the formulation of the specific product itself," Walker said.

During his presentation, Walker said the most widely believed, industry-used "rules of thumb" about sealant joint design have not changed much and that the rules, in essence, can be boiled down to a simple sentence: "Thin rubber stretches, thick rubber doesn't."

After Walker finished the topic's introduction, Muench began the main portion of the presentation. He started by discussing sealant "must-haves," which include movement capability, adhesion, compatibility and weathering resistance. "I think years ago when you thought of a high-movement sealant, the first thing you thought about was silicone," Muench said. "But technology and materials have all evolved—formulation capabilities, formulators are getting better, raw materials are improving. So, that is not the case anymore. You can get a high-movement sealant whether you have a polyurethane, silicone or hybrid. Choices are available from all the types that meet the essential requirements so all in this class are pretty much on the same equal playing field."

Muench then discussed the next "must-haves," adhesion, which allows a joint sealant to perform properly. The sealant's technology and the properties of the substrate affect the mechanism for adhesion. In practical terms, though, what matters is not how the adhesion is achieved but that it stays attached. He then discussed compatibility. "Compatibility has been and will continue to be a big issue for the industry," Muench said. "As building components change and materials change, compatibility is tested in a lot of different ways." He pointed out that there are a lot of ways to test compatibility, such as sealant to sealant and sealant to substrate. Walker added that is becoming even more important to consider with the increasing awareness of the need for air and moisture barriers and the flood of new liquid and sheet membranes entering the market.

Muench also said that compatibility testing concerning product staining has been and continues to be a topic that needs to be examined, and that silicones that claim to be non-staining still need to be tested for each project or type of stone despite their claims. Also, a product should be checked to see if it has a streaking

effect on glass. “Most know that natural stone should be tested, but you can also have issues with glass or metal panels; where products aren’t compatible with a non-porous, non-absorbing substrate, you tend to get streaking issues that could become stains,” Muench said. “In respect to the different technology, when it comes to compatibility, there is no one technology that is necessarily better than the other when it comes to compatibility. You don’t know until you actually evaluate it.” He did stress, though, that materials will always be evolving, so evaluation will always be necessary.

Muench closed this portion of the presentation by discussing weathering. “There are some inherent strengths with each chemistry, but today a lot of the weaknesses can be overcome via formulation.” He did say that this ability to combine the best qualities of each type of chemistry will continue to improve into the future, too.

Walker returned to the podium to finish the presentation by talking about the future of sealants. He said the industry should expect technology to improve, formulations continue to get better, awareness of sustainability to increase (which may hopefully cause green washing to decrease) and new environmental regulations to drive redevelopment. “We’ve already seen this in the coatings industry,” Walker said. He also said that more new sealant and also adhesive types would be available in the industry, too.

Walker stressed that companies should engage in product development, qualification testing, and application confirmation and support. “You have to continue to develop your formulation in kind with what’s going on in the building industry,” Walker said. “We’ve got to pilot formulations and test it through UV exposure, temperature and other extremes plus do application testing. We need to get these new products in the field to trial them. As much as industry standards for laboratory testing continue to improve, we still can’t prove it’s the right product for the application before actual field testing.”

According to Walker, these are the main ways that sealant producers manufacture their products.

Batch processing: This method involves bags of fillers and ingredients, drums of polymers and adhesion promoters and catalysts. Products are delivered then stored on site at the manufacturing location. Materials go through a process of blending not unlike mixing a cake. These formulations can typically be completed on either a small or large scale.

Continuous production: This entails high-volume, high-speed production that’s very consistent and precisely computer controlled. Fillers and other raw materials are delivered to the site, loaded into silos or tanks. The materials are then dispensed into the mixing machinery via piping from these vessels. While there are some exceptions, the process is not as easily capable to provide small batch quantities, such as those needed for custom colors or low volume new and specialty products.

Walker wrapped up the presentation by reiterating what’s really important for people to remember when dealing with sealant suppliers:

- Suppliers should have the ability to supply large volumes as your project may require, but also small volumes of custom colors where required to minimize waste and longer lead times.
- They should offer quality control testing for the products you receive and tell you how it's done, how many batches are checked if using statistical process control methods or whether each lot is tested before shipment
- Certificates of analysis should be available as well as assurance that testing done for quality production is in compliance with the intended applications.
- LEED submittals support: By reading properly prepared material safety data sheets, manufacturers disclose a list of the raw materials used. The proximity of the sealant production facility to the project can be assessed and any potential air quality issue understood by the VOCs reported. Lastly potential for points as innovative materials can be determined through discussion with the supplier, something often overlooked.
- For a successful sealant joint project there should be application and local field support provided as well as independent validation.

He did mention that project proximity under current and the new LEED guideline is difficult to meet for most all sealant producers. "Sometimes, these raw materials have to be shipped from all over the world, especially in the case of many new higher performance products," Walker said. LEED points for having all raw materials shipped from within a 500-mile radius to the plant and then to the work site would be rare if not impossible to obtain in most circumstances. "All of us as producers can say that's nearly impossible," Walker said. "That's not as important to consider with LEED submittals. But what is important to consider are longevity, VOCs, indoor air quality and if you can qualify for innovative materials based on a new technology and any unique way the product is used. A good example of that would be the use of new higher performance adhesives for structural silicone glazing in façade systems."

About the Presenters

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