Navigating Sealant Technologies Amidst Supply Chain Disruptions

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Having trouble finding the brands that you normally use?

This technical bulletin is here to help by outlining the various technologies that can be substituted for each other (and the differences that you should expect when doing so). Note that, as with any product, there are brand to brand quality and performance differences within a technology type.

If you have ever tried generic syrup or peanut butter, you may know what we mean. The quality of the brand is important to investigate as well as the technology.

There are two basic types of sealants, and both come with somewhat predictable performance and application characteristics. Reactive products cure by reacting with atmospheric moisture. (Reactive products react…not the most surprising name).

Evaporative products, on the other hand, dry by releasing water or solvent into the air through (you guessed it) evaporation.

SEALANT TECHNOLOGIES

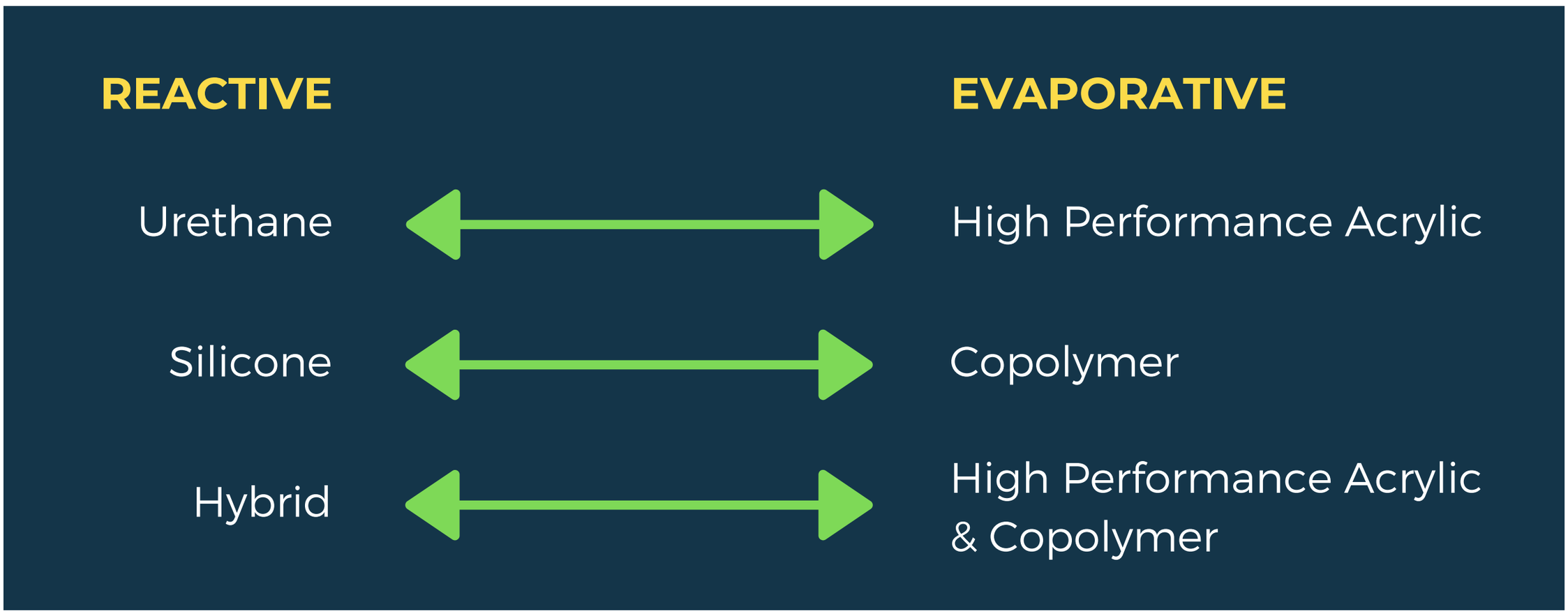

Chart 1. Technology Swaps

Reactive Curing

Reactive chemistries tend to create harder, tougher films than evaporative products. This can be a good thing because harder films can be more resistant to abrasion and avoid dirt pick up. It can also be a negative thing if there is a lot of movement in the joint where the sealant is used because extra rigidity means that the product is not as flexible or elastic to stretch and compress as the joint moves.

Reactive chemistries will dry faster. Because they dry by reacting with moisture in the air, reactive chemistries are very water sensitive. This manifests in a few ways:

- They have shorter shelf lives.
- They dry out quickly in the cartridge once opened.
- They can have finicky results when things are too wet.

If they are applied to a damp surface, they can foam up at the substrate resulting in poor adhesion.

Evaporative Curing

Evaporative technologies break into two groups; water and solvent-based. They will be slower drying as the liquid must leave in order to cure. Latex and acrylic (water-based) products can be especially slow to dry when there is high humidity. Because they are formulated with some carrier that evaporates, these products have lower solids and tend to “shrink” more than reactive products when they are applied. This can leave the sealant with a concave appearance. This is not a structural defect, but it can look a bit different if you are used to applying high solids reactive products. Because they have more liquid in them, evaporative products are typically easier to tool than their high solids counterparts (though solvent-based products can be a bit sticky). They can also have better adhesion to some surfaces because the solvent is able to wet out the surface that they are trying to stick to. Because they cure a bit softer, they tend to withstand more movement within the joint. They flex with the movement rather than resisting it.

Performance & Application Characteristics

ATTRIBUTE	URETHANE	SILICONE	HYBRID	CO-POLYMER	ACRYLIC
Tough/ hard	Yes	Yes	Yes	No	No
Relaxes when stretched	No	No	No	Yes	Yes
Adhesion to tough surfaces	Yes	No	No	Yes	Yes
UV resistance	Ok	Good	Poor	Good	Good
Paintable	Yes	No	Yes	Yes	Yes
Repairable	Yes	No	Yes	Yes	Yes

Chart 2. Performance Characteristics by Technology

ATTRIBUTE	URETHANE	SILICONE	HYBRID	CO-POLYMER	ACRYLIC
Full cure	1-7 days*	1-3 days	1-3 days	5-7 days	5-7 days
Sensitivity to moisture on surface	Poor	Ok	Ok	Good	Good
Shrink	No	No	No	Yes	Yes
Easy tool	Poor	Ok	Very Poor	Ok	Easiest
Easy to gun	No	Yes	No	Yes	Yes
Cold weather application	Difficult	Moderate	Easy	Easy	Difficult
Odor	Very strong	Strong	Strong	Strong	Very mild

**Varies based on manufacturer recommendations*

Chart 3. Application Characteristics by Technology

Urethanes & High Performance Acrylics

The first swap that we recommend is urethanes and high performance acrylics.

Both are often used because they are paintable and because they meet ASTM C-920, a specification for joint movement capability. (You can usually tell a high performance acrylic from a latex painter's caulk because acrylics will pass this spec and have more resin instead of filler. Painter's caulks are usually 85% or higher in solids because they are so highly filled.)

If you are swapping from acrylic to urethane, you need to watch out for the moisture sensitivity. They are the most moisture sensitive of any of the reactive products. They should not be applied to damp surfaces, as they can form a foam at the surface, causing poor adhesion.

Urethanes come with isocyanates, which are nasty chemicals that can be skin irritants, so they are typically used outside. Finally, urethanes can be a bit more challenging to tool. They get a bit stringy if you try to work them with your finger.

When you to switch from a urethane to an acrylic, you will want to watch for the slower dry time and shrinkage of the evaporative products.

Acrylics can also be a bit less forgiving in cold temperatures. If you are able to get the urethane to dispense out of the gun, it will cure at that low temperature.

Examples of Acrylics

Examples of Urethanes

Silicones & Copolymers

Both silicones and copolymers are extremely moisture resistant which makes them great for exterior environments. They also have superior clarity to most other technologies. Silicones have great adhesion to some tough-to-coat surfaces like glass, tile, and aluminum.

If you are swapping from a copolymer to a silicone, be mindful that you can't paint the silicone.

Silicones are also prone to tearing. If they do tear, they are a pain to replace because you can't recoat a silicone with itself either. You have to tear it out and replace it completely.

Silicones can come with a bit of a smell. Depending on the type, they may smell a bit like menthol or vinegar when they dry.

Copolymers have a high degree of elasticity, meaning that they will be in a relaxed state rather than stressed when compressed or stretched. If you swap away from silicone to a copolymer, you need to watch for the shrinkage and slower dry time typical of an evaporative product.

Copolymers also have some solvents like toluene that can be skin sensitizers and are flammable.

Copolymers are a bit stickier, which can mean that it is tough to get them off your fingers when tooling. If you put a little drop of soap with some water on your fingers, you should be able to tool a really nice bead with a copolymer.

Examples of Silicones

Examples of Copolymers

Hybrids & Copolymers or Acrylics

Hybrids, sometimes referred to as MS polymers, are a hybrid (imagine that) between urethanes and silicones, bringing some of both the good and bad characteristics from each.

They have great chemical resistance, but these can be painted, unlike silicones. They also have good flexibility and elasticity.

Since they are a hybrid, they can sometimes be swapped for high performance acrylics and sometimes for copolymer rubbers. When swapping from copolymer or acrylic to a hybrid, watch out for the poor UV resistance. These products tend to turn yellow pretty quickly.

Like urethanes, they also run into some issues with damp surfaces. One of the more interesting things about this swap is that manufacturers often recommend that hybrids not be tooled, which can lead to application issues with beads that do not look great.

Examples of Hybrids

Summing It Up

While supply chains are disrupted, many contractors are forced to use materials that are different than what they are used to using. Most would rather go up in performance than risk using a low quality product that could cause failures and damage their reputation.

When possible, it may be ideal to switch to the same technology from a different brand. When that is not an option, swap urethanes with acrylics, silicones with copolymers, and hybrids with either acrylics or copolymers depending on the situation.