

Put An End To Adhesive Mixing Errors

With dual-barrel cartridge dispensing

Anyone who has worked with two-component adhesives in a production environment knows that it can be tricky to get the mix ratio right day in and day out. In fact, we've found that mixing errors are the leading cause of manufacturing inefficiencies and scrap in both bonding and potting operations.

What makes it so difficult to get the mix right? It all comes down to the precision requirements and the propensity for human error. Many two-component adhesives require precise proportions of hardener and resin, and even a small deviation from the ideal mix ratio can keep the adhesive from curing properly. For example, poorly mixed adhesives may not cure to their full hardness. Or they may not cure at all.



A bad mix can also trigger high exothermic reactions that can damage nearby components or cause out-of-control shrinkage. These reactions can be especially costly if they ruin populated circuit boards, which is a distinct possibility since the potting compound is typically applied last.

The worst mixing errors are the ones that you don't notice right away. Incorrect mix ratios can result in an adhesive joint or encapsulation that looks good but actually suffers from diminished mechanical and physical properties.

One of the most effective ways to avoid mix-ratio problems is to use a dual-barrel dispensing gun that works with cartridges containing the required adhesive components.

Our **TriggerBond®** system is a good example of this dispensing approach. It provides consistent,

volumetrically-precise control of the adhesive components. It also makes the mixing and application of two-component adhesives less messy on the shop floor. And unlike automated dispensing systems, TriggerBond requires no investment in capital equipment.

In the right application, the advantages of TriggerBond dispensing can be compelling. Manufacturing operations become more efficient—in part because TriggerBond dispensing is fast and in part because it prevents rework and scrap.

However, not every application is well-suited to TriggerBond products. With that in mind, here's an

overview of the application requirements that are a good fit:

The right type of adhesive. TriggerBond can accommodate a broad range of adhesive products, but some formulations simply don't lend themselves to this kind of dispensing. Highly-filled products, such as thermally conductive potting compounds, don't tend to work well in dual-barrel cartridge dispensers. Other adhesives have extreme viscosities that may rule out their use in a TriggerBond dispenser. And finally, TriggerBond works only with adhesive products that have fixed mix ratios. Even with these limitations, we have over 50 TriggerBond-friendly formulations available.

MIXING UP THE MIX RATIOS

For two-component adhesives that need to be mixed by hand, mix ratios can be given by weight or volume. The ratios are usually expressed in terms of parts per hundred (PHR), with the correct amounts of each adhesive component calculated by the following formulas:

$$\text{PHR}/100 \times \text{Weight of Resin} = \text{Weight of Hardener}$$

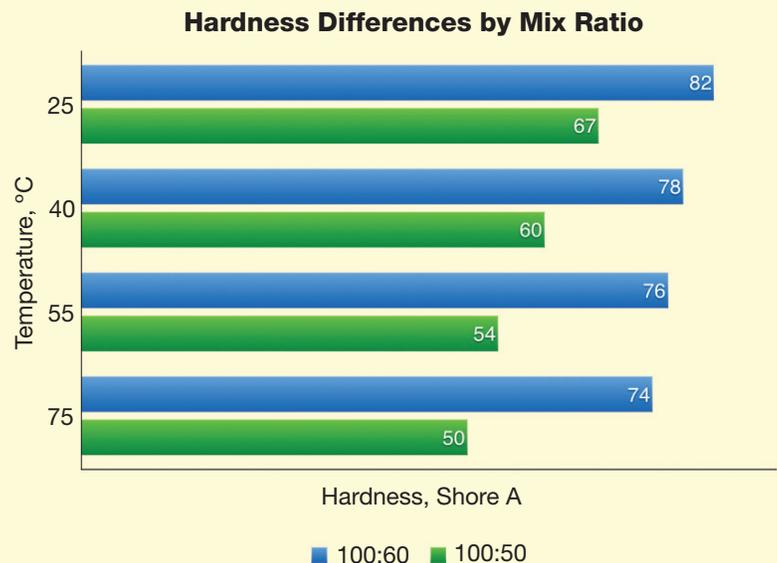
$$\text{PHR}/100 \times \text{Volume of Resin} = \text{Volume of Hardener}$$

To get the right mix, the user has to use the correct PHR spec and calculate the appropriate measurements of the resin and hardener. The ingredients are then weighed out on a scale or measured in a graduated cylinder.

Sounds simple enough, but this measurement process can be fraught with errors. Mistakes in the PHR calculations and measurement processes happen all the time.

One of the most common errors involves mixing up the by-weight and by-volume mix ratios, which will differ for a given adhesive product.

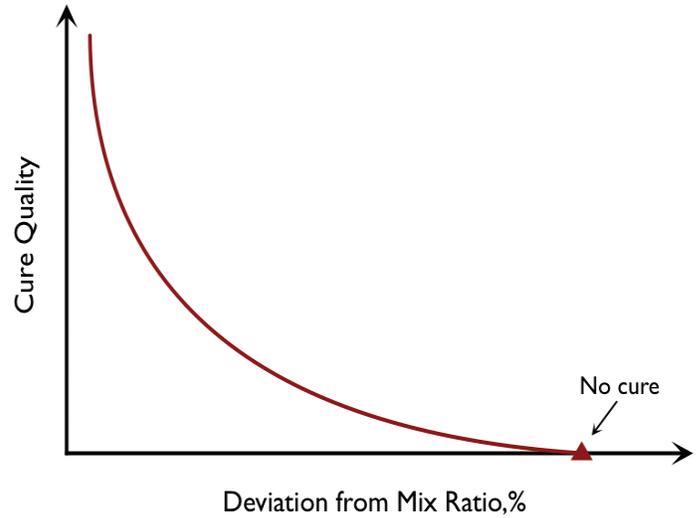
If you do confuse the two ratios, which is a common mistake, the adhesive properties will suffer. To illustrate this point, we mixed up two batches of our 20-2180, a popular polyurethane potting and encapsulating product. Batch One has the correct 100:60 ratio by weight. Batch Two had a 100:50 ratio by weight—which is the correct by-volume ratio. You can see that this seemingly small mix error keeps the adhesive from developing its full hardness at room and elevated temperatures. The drop off in hardness as temperatures increase is also more pronounced with the incorrectly mixed batch.



The right production volume. For high production volumes, other automated dispensing systems tend to become more efficient than TriggerBond. For example, TriggerBond may not be the best option for a continuous sealing application that requires a bead of material dispensed over a long distance—such as automotive window sealing applications. Even if you do have a high-volume application, keep in mind that TriggerBond can help you scale up to full production volumes. Prototype and first article production may start out in TriggerBond even if ongoing production uses some sort of automated dispensing.

Consistency between the TriggerBond and bulk formulations makes it possible to scale up without changing adhesives.

The right workflow. TriggerBond is particularly useful in assembly lines that require intermittent adhesive application. Many job shops fall into this category. So do many lean, just-in-time and continuous-flow assembly lines. In these cases, buying adhesives in bulk may not



make sense, even if production volumes are higher than our rule of thumb.

More information on our TriggerBond adhesives can be found here:
<http://www.epoxies.com/products/triggerbond/>



Dual-barrel Dispensing Tips

Dual-barrel cartridge dispensers are extremely easy to use, which is the whole point. But they are not completely foolproof.

In fact, some of the same cure and application problems that can plague traditionally-mixed two-component adhesives can also affect cartridge-based adhesives if you don't pay careful attention to the setup of the dispensing gun.

Fortunately, all it takes to avoid any dispensing problems is following a few simple steps:

Use the best mixer. The dispensing guns are outfitted with one of several interchangeable static mixers, and each adhesive product carries a recommendation for a specific element. It's important to follow that recommendation because the individual mixers have to be matched to each adhesive's viscosity characteristics.

Attach the mixer. Different size cartridges also have different attachment methods. On 50- and 75-ml models, the luer-style mixers attach to the cartridge with a twist. On 200- and 400-ml models, a locking nut slips over the mixer and secures it to the cartridge.

Get the ratio right. Dispensing guns can support a few different mix ratios—typically, 1:1, 2:1, 4:1 and 10:1. So make sure the mix ratio setting on the gun is correct.

Orient the cartridges. Cartridges for 2:1, 4:1 and 10:1 adhesives have one correct orientation relative to the plungers on the gun.

Inspect the cartridge. It's a good idea to check the cartridge pistons to verify they are at an even height. Also, there should not be any visible evidence of air pockets along the cartridge walls.

Fire a blank. The first shot of material very often does not mix well, especially with lower viscosity products. So you should always dispense and discard a small amount of adhesive when you start a new cartridge.

Dispense properly. Different adhesive products have different recommendations for dispensing style—such as dots or beads. For most consistent dispensing, we also recommend that you hold the cartridge horizontally with a slight downward angle.

Mind the clock. Fast curing epoxies can begin gelling in the static mixer after just a few minutes. If there are long pauses between applications, the mixer should be removed and replaced.

And finally. Don't forget to remove the cap from the cartridge.