Ask Joe Powder

Path of Least Resistance

Q Dear Joe,

Aluminum vs. steel. The coatings are coming out different. The aluminum has a thinner mil build than the steel using the same manual gun. Any thoughts we could give to our customer?

Steven, Syracuse, N.Y.

A Hi Steven,

This is an interesting question. Theoretically, there is no reason for powder to deposit differently on steel vs. aluminum. Both metals are conductive enough to allow an even deposition of powder. Hence, this begs a few questions. As we both know, film thickness measurement on ferrous substrates uses magnetic force to quantify coating thickness, whereas film gauges for non-ferrous metals use eddy current technology. Some film gauges have both mechanisms in the same instrument, others do not. I wonder if perhaps the film thickness measurement is suspect. What do you know about the customer's instrumentation and calibration technique/frequency?

If this is not the issue there may be a difference in path to ground for the aluminum vs. the steel substrates. Are the same hooks used for both metals? Are they in different condition? Poor film build is most often caused by a poor ground. The electrons emitted by the tip of the gun have nowhere to go and consequently the powder does not build.

So, what to do? Check out the instrument issue and verify the thickness measurements. Then investigate the continuity to ground. This is best accomplished with a megohmmeter, also known as a Megger. The resistance of the part to the ground must not exceed 1MΩ. If it does, then investigate all connections from the part to earth. Ensure that they are clean and making good contact. Thanks for the question.

— Joe Powder

Zeroing in on Pinhole Problem

Q Dear Mr. Joe,

What are the possible reasons for micro pinholes in powder coating?

Regards,
Ramesh V.

A Dear Mr. Ramesh,

This is a very common, but an oftentimes perplexing, problem with powder coatings. And there are many possible causes for the incidence of pinholes. Let's run down the list.

1. **Hot dipped galvanized steel (HDG).** This is notorious for causing pinholes in a powder coating finish. Some say it's due to the evolution of hydrogen, others think it could be from entrapped air/moisture. Regardless, it is always wise to preheat galvanized steel prior to applying a powder coating. You can let it cool to almost room temperature, but you better get the powder on quick or the pinholes will reappear.
2. **Volatiles of cure.** TGIC-free polyesters (a.k.a. hydroxy-alkyl amide or Primid™) will exhibit pinholes if applied too thick. Films over 100 microns typically show this defect. Ditto for most polyurethane powders. They emit a blocking agent, typically e-caprolactam, which causes pinholes at thick films.
3. **Moisture.** If the powder container has been left open in a humid environment, the coating may absorb moisture which can cause pinholes during film formation in your oven. A moist substrate can cause

the same problem. So, keep your powder dry and make sure your substrate is completely dry before applying the powder.

4. **Bad or old powder.** If your powder is more than two years old, it may have picked up moisture even if the container appears to be sealed. Try fresh powder to see if the problem disappears.

5. **Contamination.** Cross contamination between dissimilar powders could be the culprit. Keep your powders separate and thoroughly clean your application equipment when switching powders. Defects caused by cross contamination can range from lower gloss to pinholes or even craters.

These are the first places I would investigate to zero in on a pinhole problem. Good luck and let me know if you have further questions.
Best regards,

— Joe Powder

Pinholes like those seen here are a common but perplexing problem with powder coatings. They can happen for a range of reasons, including those listed in Joe Powder's answer above.

Fill in the Gap

Q Dear Joe Powder,

I need to fill some gaps I have in a welded aluminum frame and I was wondering what was the best type of "bondo-type" filler that wouldn't outgas too badly and ruin my finished powder coat. I would prefer an epoxy or something that wouldn't necessarily need a preheat or super long cure time, but I do understand there are tradeoffs and I probably won't be able to find a product that applies to metal, dries and sands smooth and doesn't out gas. Any product recommendations would be great.

Thanks,
Matt K.

A Hi Matt,

Sorry for the late response; your query slipped through the cracks. Your observation regarding fillers is right on the money. Traditional auto body fillers based on polyester resin (e.g., Bondo®) work fine for room-temperature cure applications such as refinish paint. They blister and outgas at elevated temperatures typical for powder coating cure. There is a solution, however. Alvin Products has a product called Lab-metal that works well as a high-temperature filler for parts to be powder coated. (See http://www.alvinproducts.com/Product-Line/aT/View/ProductID/3/Lab-metal) It's a one-part, aluminum filled product that is easy to apply. Please note that they specify that Lab-metal is good to 350°F. Hence, the powder coating you use will have to cure at a temperature below that. Low-temperature cure powders are fairly common, so consult your coating supplier for the powder that's right for your application.

— Joe Powder

Joe Powder is our technical editor, Kevin Biller. Please send your questions and comments to Joe Powder at askjoepowder@yahoo.com.

Editor's Note: Letters to and responses from Joe Powder have been edited for space and style.

Not Your Average Joe...

Each issue, we take the padlock off the PCI® Test-Lab door for a few minutes so our favorite technical editor and "powder guru" Joe Powder can run in the yard. When he's not gnawing on a rawhide bone, he loves to answer readers' questions. Go ahead and send him one at askjoepowder@yahoo.com... he doesn't bite. Maybe it'll end up in the next issue!