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Ask Joe Powder

Tips for Temp Tracking Tools

Dear Joe,

Q I work as a sale (service) guy for powder coating equipment in Serbia. A customer asked me for a measuring device that is able to measure parts temperature in multiple spots during time spent in a polymerization oven. Which products are most accurate for temperatures up to 830°C?

Kind regards,

Nikola J.

Dear Nikola,

A It's nice to hear from Serbia. I hope that your powder coating operation is going well, and I am happy to help you. Indeed there are instruments designed to measure the temperature of parts in multiple locations. These devices were developed in the 1980s and are an excellent way to ensure part temperature versus time. This data is essential to knowing if your coating is developing full cure. As you probably know you should adhere to the recommended time and temperature stated on the powder coating Technical Data Sheet provided by your supplier.

The most common instrument is the DataPaq Oven Tracker® (see: Scheen Engineering Ltd. in Hungary) but there are many other products from other equipment houses such as TQC (Nederlands) and Grant Instruments (see: Tectra Beograd in Serbia).

You mention that you need the instrument to be accurate to 830°C which is rather high for a powder coating. This requirement may force you to consider a specialized device to be able to withstand temperatures this high. Most of these instruments use a thermally insulated box to protect the data logger while it is exposed to the heat in the oven. You will have to check with each supplier to see what they offer.

Good luck.

— Joe Powder

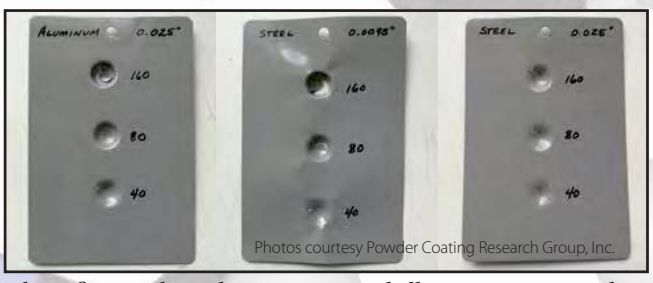
Brace for Impact

Hi Joe,

Q We have been developing new polymers for powder coatings. One of the most critical properties is impact resistance. Our test results have been inconsistent and vary significantly depending on substrate used. In some cases the coating passes 160 inch-lbs. and with other conditions only gets 80 inch-lbs. What could be the cause of this variation? And how can we eliminate these variations?

Thank you!

Rebekah



These figures show the impact in inch-lbs. comparing steel and aluminum in various gauges.

Hi Rebekah,

A First of all, kudos to you and your colleagues for developing new polymers. Most advancements in in powder coating technology are based on new and improved polymer chemistry. It's tough for us formulators to create new coatings without innovative polymers.

The most common impact resistance test method is described in ASTM D-2794 Standard Test Method for the Rapid Deformation of Organic Coatings (Impact). The values typically quoted in impact resistance are inch-lbs. (the metric centric folks use Newton-meters) and refer to the weight times the distance (height) of the impact. Another parameter is the radius of the "ball" or hemisphere

that impacts the surface of the coating. North America typically uses a 5/8 inch diameter ball although some specifications call for a ½ inch one. The smaller the diameter, the higher the deformation and hence lower impact resistance.

Besides the coating's inherent flexibility, substrate has the most significant influence on film performance. Adhesion is affected by the type of metal, the surface profile, cleanliness and pretreatment. Impact resistance is affected by adhesion, so poorly pretreated substrate will cause unexpected impact failure. On the other hand, well pretreated metal will enhance impact resistance by providing a strong bond of the powder to the substrate.

In addition to metal preparation, the gauge and type of substrate significantly influences impact resistance because of the degree of deformation to the substrate. Hence 80 inch-lbs. on a ductile grade of aluminum will have different deformation than carbon steel. And certainly the gauge or thickness of the metal will also influence deformation and therefore impact resistance. Thicker gauge metal will deform less and therefore the coating experiences less stress.

Coating parameters to control are mainly film thickness and degree of cure. Thinner films tend to exhibit higher impact resistance whereas thicker ones are more brittle. Complete cure is highly recommended as undercured powders will usually have lower impact resistance. Make sure your coating receives the time at temperature specified by the coating supplier.

When characterizing a coating for impact resistance the challenge is to use substrate(s) that are relevant to the target market(s). For general industrial end uses, cold rolled steel is relevant whereas the architectural market typically uses various grades of aluminum depending upon the forming and parts requirements. In addition, pretreatment type is important. Cold rolled steel is usually pretreated with a phosphate (iron or zinc) or in newer installations a zirconium-based product. Aluminum is typically pretreated with chromate, zirconium or sometimes zinc phosphate. For polymer development I suggest that you obtain your substrate from a reputable test panel supplier. A list of them can be found on the PCI website (www.powdercoating.org) under "Members."

Good luck with your polymer chemistry efforts, the industry needs you. Warm regards.

– Joe Powder

Hero or Zero

Q Dear Joe,

The boss is at it again. He wants me to coat some parts for a "government" project and I am unsure as to what powder to use. These are 16-inch tubes made out of galvanized aluminum. They

are for his boat which obviously means they need to withstand a marine environment. Our shop usually applies an epoxy primer, "gels" it, then follows with a polyester topcoat and then cure with a full bake. Will this be OK for the boss's parts?

Sincerely,

Leonard

Dear Leonard,

A Looks like you need to make sure these work out or you'll be on your boss's wrong side. I'll have to be honest with you, I can't say that I have encountered galvanized aluminum before. I will take your word for it however.

My recommendation is to thoroughly clean the galvanized surface with a strong alkaline cleaner and a good, clean rinse. Alternately, you could wipe the surface with a good solvent such as acetone. Allow the surface to dry then preheat the part at 375°F (part temperature) for a few minutes. This degasses the galvanizing which can harbor moisture and other volatiles that can cause pinhole defects. Allow the tube to cool to around 160°F, then apply the epoxy primer. I recommend a standard epoxy primer (not a zinc-rich one as the zinc is overkill on a galvanized surface). "Gel" the epoxy with a modest bake of around 300°F for 5 minutes (again, metal temperature). Cool the part then apply the polyester topcoat and fully cure per the powder manufacturer's Technical Data Sheet. The gel bake of a primer followed by a full cure of the topcoat/primer combination ensures good inter-coat adhesion.

Do this with one part and evaluate the adhesion with a non-destructive test. Tapping on the surface with a small ballpeen hammer should work. If everything looks good, then proceed with the rest of the parts. Good luck with the "government" work. I will have to consult with some of my colleagues to see what they know about galvanized aluminum. Best regards.

– Joe Powder

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!