Ask the Experts

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Your questions answered by PCI member experts.

You have questions, we have answers. In each issue of PCT, *our extensive network of powder coating experts provides information to help you with your powder coating challenges. Let us know what's keeping you awake at night, and we'll do our best to help you get a good night's sleep!*

Heavy Load

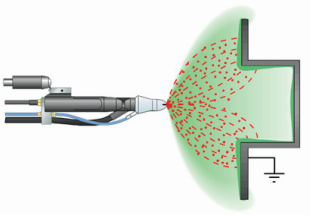
I would like to know the best process for powder coating a steel plate that is 27" x 62" and 2.75" thick. We have powder coating capabilities in-house and have both a conveyorized line and a standalone booth with a batch oven. We are a sheet metal fabricator, so we have experience with sheet metal parts. A steel plate 2.75" thick is not going to react the same way a 1/8" piece of sheet metal does. It is for an indoor application. I thought we would suspend the plate on a frame with wheels, wipe it down with isopropyl alcohol, mask it, and then preheat it in the oven for an hour or so at 400 degrees Fahrenheit. Then bring it out, apply the powder, and return it to the oven to cure the powder. My questions are if there are other people who have been successful powder coating steel plate that is this thick, what are the concerns, and if there are any process steps that should be followed that I should be aware of? Or, should I abandon the idea of powder coat and wet paint the plate instead?

You are on the right path. Wiping down the steel plate would work to clean it. If this is going to be an ongoing product, not just a one-time event, you might consider a batch wash booth that you can use as a manual wash station to clean the plate and then apply a conversion coating, such as iron phosphate or zirconium, for better corrosion resistance. As far as curing is concerned, if you preheat the part and then coat it, you will apply a thicker powder coating on the part as the powder will start melting as soon as it is applied. If a thicker coating is acceptable, then this approach would be fine. Otherwise, run a test by placing a temperature probe on the part in several locations using a temperature recorder to see how long it will take for the plate to get to the powder cure temperature specified on the product data sheet. Once this is determined add the time required to cure the product at that metal temperature. For example, if it takes 30 minutes to heat up the plate and 12 minutes to cure, you can set a timer for the plate to be in the oven for 42 minutes. If you don't have a temperature recorder, your powder coat supplier may be able to send or bring one to you to do the testing.

The Faraday Phenomenon

I am a manufacturing engineer at an OEM. We are currently in the process of switching nearly all our products over from liquid paint to powder (epoxy-based powders for encapsulation and performance reasons.) Our parts are very geometrically complex, and we are struggling to get full, even coverage. We tend to have thin film build in the Faraday cages and too thick on our outside flats and larger sections with fewer features. What would be suggested to help us alleviate our problems?

There are many companies that powder coat difficult products. This is a classic Faraday cage issue. It happens a lot on wheel coating lines where the painter is trying to get the powder into the lug nut recess and by the time he is done, there is a heavy buildup on the top corners. To get to the possible solutions it helps to first understand the physics of what is going on.



Faraday cage penetration difficulties are caused by excess free ions created by powder guns at 100kV. In general, 80% of ions created at 100kV are considered excess free ions as they do not attach to powder particles, but in fact, attach to air molecules. In nature, nothing wants extra "things" attached to them, so in this case these powder particles and air molecules look for the closest point of earth's ground to attach to and discharge this negative ion. When spraying powder into recesses, the powder particle has mass (weight) compared to the air molecules, so they have the momentum to help carry them into deep recesses. However, the charged air molecules find the closest point geometrically (usually the outermost point

in a Faraday cage) to attach to. The high volume of charged air molecules drawn to these points creates an electrical field that draws much of the charged powder particles with it, causing heavy powder buildups on the outer edges of the Faraday.

The best way to eliminate this is to reduce the amount of excess free ions created in the first place. This is done by reducing the gun current (microamps) to a significantly lower level when coating Faraday areas. There are many ways to accomplish this, and the major powder gun manufacturers have incorporated one or more of them into their application equipment. Most powder guns have a feature that can control or limit the amperage or manipulate the voltage. This reduces the strength of the charge, therefore giving the powder a better chance of getting in the corner. If you can control the current and/or charge, you will have better control of where you want the powder to go. Also, best practices show that if you can coat those Faraday cage areas first, where the part is still "fresh and new," then you will find that you probably coated about 80% of the easy areas. This offers more consistent coverage all around. Remember, it is most important to reduce excess free ions to get optimal Faraday cage penetration without heavy edge buildups.

Ripple Effect

My company manufactures tent cases and is experiencing random ripples or softness on the edges of the powder coated panels which are made of 16-gauge aluminum sheets. Could it have anything to do with their prep in the powder coating process? The product is washed and then dried at 350 degrees Fahrenheit for 20 minutes, after which it is powder coated and baked at 350 degrees Fahrenheit for 12 minutes. This is the same procedure that has been used for years and nothing has changed. I would appreciate any input.

Without some additional details it is a challenge to answer your questions, but here is some information that could be helpful. You didn't mention coating film thickness but it can be a contributing factor to ripples (sagging) or inconsistent film build. You noted the product was washed and dried at 350 degrees Fahrenheit but what was the temperature when the part was powder coated in the powder booth? If it was elevated, then this might be causing higher than normal or inconsistent film builds. This might be worth investigating because the cure temperature and time seem proper for the material thickness. Have you discussed this issue with your powder supplier? If not, they can powder coat test panels in the lab that are already pretreated to see if the same issue happens. This would eliminate one variable and help determine whether it is the pretreatment or the powder causing the problem. Pretreatment typically doesn't cause this type of problem, however, you only mentioned that the part was washed and dried (assuming no wet areas) so it is difficult to provide additional information not knowing if cleaning or pretreatment chemistries were used.

Rust's Nemesis

I am trying to fact find about rusting steel items under the powder coat. It seems like the quality of steel we are getting has been contributing to this issue. Do you or any of your members have any input? Do we need to add an additional chemical to our last stage to solve this? Thank you in advance.

It could be that the rust preventative on the steel may have changed from your steel supplier or, perhaps you are now purchasing it from a different vendor. In order to really find out, you would need to get reports from the steel manufacturer on the composition of the steel and any rust preventative used and compare them. If you are unable to get reports, you may just talk with the steel supplier about it. Another option would be to talk to the chemical supplier for your pretreatment washer. They can take some sample parts and do testing at their lab to determine what type of chemistry is needed to clean properly, and which conversion coating would achieve the corrosion requirements to meet quality expectations. The cleaning and conversion coating play a significant role in corrosion resistance and to promote proper powder bonding.

Bye Bye $BaSO_4$

I just started with a new company a month ago and I am concerned about the proper disposal of powder coating that we use here. The powder contains Barium 7727-43-7 barium sulfate, natural. I contacted the powder manufacturer, and they can't advise on proper disposal. I am wondering if the powder coating is hazardous waste or non-hazardous waste but regulated. We are located in Maryland. Hope you can help me!

For most powder coating, the disposal is typically considered non-hazardous. However, locations around the U.S. and the world have different regulations concerning solid waste disposal. The first recommendation would be to talk to the powder producer, but you already did this and did not get an answer. The next step might be to contact someone who manages the disposal site or a local authority having jurisdiction to find out if the ingredient would be allowed in the landfill. Since powder coatings are extruded, the chemicals normally cannot leach out of the powder after it is either applied to a product or disposed of. The only other suggestion would be that it is best to place waste powder in a plastic bag made for powder disposal or place it in a shallow disposable pan and melt the powder by putting it in the vestibule of the oven. This enables you to dispose of a solid chunk rather than the powder be allowed to blow around in the landfill.

Have a question for our powder coating experts? Send it to asktheexperts@powdercoating.org.