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!

DIY Essentials

I am considering opening a custom powder coating shop, and to start, I plan to limit the size of the products I can coat to fit within a product envelope of four feet wide by six feet high by 10 feet long. Since my budget is limited, I hope to build as much of the equipment as possible myself. I understand that I will need to purchase the powder coating guns and other specialized equipment. With this in mind, I would like to know what factors I should consider when constructing the powder booth and oven. My plan is to have an open-front powder booth with filters located at the back, and the oven will feature a single product door on one end.

First, congratulations on your decision to join the powder coating industry. Many custom coaters have started small, just like you, and have grown over time. It is recommended to purchase your booth and ovens from companies that specialize in designing and manufacturing them, as they are familiar with the codes and requirements necessary for safe and effective operation. However, if you decide to construct your own equipment, you should familiarize yourself with and fully understand the relevant codes and standards, including:

- National Fire Protection Codes (NFPA 33, NFPA 68, NFPA 69, NFPA 86).
- International Fire Codes.
- National Electric Code.
- OSHA rules and regulations.

These are the codes that local building inspectors, fire marshals, insurance companies, and other authorities having jurisdiction (AHJ) will enforce. Failure to comply with these codes could result in your shop being shut down. Additionally, these codes will help you identify hazardous zones, where you must avoid using electrical devices that are not rated for those areas.

You've already taken the first important step by identifying the size of your part envelope. With that in mind, you need to ensure the powder booth is large enough to provide at least three feet of space around the part envelope. This allows you to properly spray the powder onto the part. Next, you'll need to ensure that the booth has an airflow velocity of between 80 and 120 feet per minute, drawn through the front of the booth. This will determine the size of the exhaust fan you'll need to meet the codes. Also, make sure that the booth is properly grounded. This is for safety reasons as well as powder operations.

For the oven, there are a few key considerations. The oven's exhaust system must comply with codes related to purge times and safety devices. Additionally, the oven should have adequate explosion relief areas in case of an incident. Finally, monitoring and controlling the temperature within the oven is crucial to ensure the powder coating material cures properly to meet your customer requirements.

Performance Anxiety

It seems that my convection oven is underperforming, and I am not achieving the proper cure of my powder coated parts. Can you suggest areas I can review to find what the issue might be?

Oven underperformance can occur for a variety of reasons, making causation difficult to pinpoint. The most common reason is an undersized burner. The size of the burner must be matched to the load being processed, which can be calculated by any experienced oven manufacturer. If the burner size is appropriate, other factors like age and poor maintenance can contribute to substandard performance. Over time, components wear down or lose efficiency, leading to a decrease in overall effectiveness.

An often-overlooked cause of underperformance is inefficient air flow. An oven recorder can be helpful by analyzing the duct velocity and layout, providing valuable insight into why the oven isn't meeting its performance goals. For example, a common issue is a sluggish "ramp" phase, where the oven fails to heat up quickly even when set to 400° Fahrenheit. While there may be enough energy in the system,

it's not being utilized efficiently. Air flow is critical to energy transfer. The air in the oven carries heat to the product, so slower-moving air results in slower heating. To optimize performance, it's important to map both the air velocity and the air path throughout the oven. This helps identify any areas of low air flow or impingement velocity. If the temperature recorder graph shows a dip below the setpoint, it could indicate a closed or partially closed damper in the ductwork, which is restricting airflow and affecting performance.

Fishing for Defects

We were recoating some precoated Q-PANELS to qualify the powder, and on our recoated panels, we noticed both fisheyes and orange peel. We also practiced recoating actual production parts to get customer approval for recoating as needed, but these parts also showed the same defects.

After researching online for ways to prevent this from happening (have a good ground, low voltage, don't overcharge the powder) multiple videos mentioned that they had to put the parts back in the oven to heat them up to get rid of any residual charge the part/coating may have. I didn't see anything in the PCI Handbook saying to reheat the parts to avoid this issue.

Can you provide more insight into this method of reheating to dissipate residual charge, and is it really necessary? We plan to powder coat parts with thicker coatings (8-10 mils), which will require multiple layers. Any advice or information would be greatly appreciated.

The term "fisheye" typically refers to a defect caused by contamination beneath the coating. According to the PCI definition, a fisheye is described as a large surface depression in a coating film, often resulting from contaminants like oil or silicone. Make sure the appropriate pretreatment process is being used, the titrations and pH levels are correct, and that no lubricants or other contaminants have been introduced to your line that can cause these defects.

The other issue you might be experiencing is "back ionization," which occurs during the electrostatic application of powder coatings. It happens when an excessive buildup of charged powder particles prevents further deposition on the substrate and can even reverse the electrical charge of the powder layer. When this happens and the powder is cured, it leads to orange peel, a condition where the surface of the coating develops a wavy, irregular texture. Orange peel appears as a rough, uneven surface to the eye but is typically smooth to the touch. These definitions can help you assess the issue you're seeing on your parts. Below are some general recommendations that can help address both back ionization and orange peel:

- Grounding is king, so make sure your parts are grounded. This is often overlooked by many coaters.
- Reduce the electrostatic charge that is being produced by the gun. This is accomplished by lowering the current setting on your gun control unit. If your gun control unit does not have current control adjustability, then you will need to lower the voltage setting.
- Increase the target distance. Moving the gun further away from the part will reduce the overcharging of the surface.
- When using a manual handheld spray gun, you can speed up the motion of the gun. This is to avoid the gun lingering over an area too long, which leads to overcharging/back ionization.
- Consider using a grounding ring accessory. This helps to pull excess electrostatic charge to ground and reduces orange peel. The grounding ring will also help to "smooth out" the coating when you are applying thicker coatings. This is something that could help since you are looking to apply 8-10 mils.
- In some cases, preheating the part can help. Heating the coated part will dissipate any residual charge that may be left in the substrate. When a part is preheated, it is typically prior to powder coating. This allows the initial powder layer to begin the melting process thus enabling the subsequent powder particles to build up to the desired level and avoid back ionization. Additionally, powder coatings typically will self-limit once you get around 7-8 mils, so preheating is the go-to method to get a thicker coating.
- One other thought is to look at the powder coating and consult your powder supplier. If you are using a powder that is formulated to be applied at 3-5 mils, to achieve 10 mils, you most likely will have issues. Powder formulated to be applied at thicker levels has a larger particle size to help you achieve the desired thickness much easier and faster.

Static Cling

I've been curious about using a static gun that could potentially help with recoating, and possibly even with heavily coated hooks and racks. Do you have any experience with this technology, or is it a waste of time? Any feedback would be greatly appreciated.

The static gun is primarily used with liquid paint on plastic parts to remove static charges from the surface. Static can cause issues by attracting dust particles to the surface of a part, which can lead to defects. Since plastic is an insulator and doesn't allow the part to be grounded, the static charge cannot be eliminated in the same way it can on a metal part. However, because powder coating requires a grounded part to attract and hold the powder, a static gun wouldn't be effective in this situation.

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