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!

Smooth or Chunky

Over the years, our powder coating shop has accumulated a variety of powder types and colors leftover from previous jobs. How long can these powders be stored effectively, and what signs should we look for to determine if older powder is no longer suitable for use?

For a powder coating to be applied effectively, it must be free-flowing, easily fluidized, and capable of melting and flowing uniformly to produce a consistent film with the desired appearance and protective properties. These characteristics can degrade if the powder is not stored under appropriate conditions.

While some packing of powder during storage is expected, proper environmental controls are essential to prevent two key issues: sintering and reaction advancement.

Sintering occurs when adjacent particles bond due to exposure to heat, often worsened by moisture and pressure. Although sintered powder may resemble packed powder, it cannot be restored to a free-flowing state through simple mechanical means like sieving, stirring, or fluidizing. Minor sintering may lead to uneven application and clogged feed systems, while severe sintering can produce solid blocks of material. If your powder clumps look glossy and partially melted, you're likely seeing storage-induced sintering.

Reaction advancement is typically the result of excessive heat during storage and manifests as increased surface texture or "orange peel" in the cured film. Powders formulated for fast or low-temperature curing are particularly vulnerable to this. If the powder still looks dry but won't cure properly or hold electrostatic charge, you're likely seeing reaction advancement.

Sintering and reaction advancement can occur independently, and each poses unique application challenges. Therefore, it is essential for powder coaters to understand and monitor the storage tolerances of each powder type. Manufacturers typically provide shelf-life guidance based on storage conditions, but real-world durability will depend on variables such as temperature, humidity, and pressure.

Powders known to be storage-sensitive should be inspected upon receipt and stored strictly according to manufacturer recommendations to avoid performance issues.

Becoming an Aluminum Authority

I have been powder coating on steel for many years. I have a new opportunity to powder coat on aluminum extrusions. What do I need to understand to properly coat on aluminum?

Extruded aluminum is widely used in applications such as fencing, interior walls, office furniture, storm doors, window frames, and both light and monumental commercial buildings. Cast aluminum, on the other hand, is commonly found in automotive parts, outdoor and indoor furniture, and various other components. These products are typically coated to meet specific appearance and performance requirements defined by architects or end users.

Powder coatings on indoor products must withstand impacts, chemical exposure, and other mechanical stresses. Outdoor applications are subject to additional challenges, including UV radiation, moisture, and corrosive atmospheric conditions. The final performance of a powder coated aluminum product is influenced by several factors including surface preparation and coating material selection.

To ensure proper adhesion and corrosion resistance, similar to steel, the aluminum surface must be clean, dry, and properly treated prior to coating. Surface preparation typically includes both mechanical and chemical processes, each selected based on the desired performance characteristics and the product's end-use environment. Common preparation methods include:

- **Abrasive blasting:** Removes inorganic contaminants such as oxidation and roughens the surface to enhance mechanical adhesion.
- **Chemical cleaning:** Removes organic contaminants including dust, oil, and grease.
- **Chemical etching:** Eliminates aluminum oxide and other inorganic soils.

- **Conversion coatings:** Improve both chemical adhesion and corrosion resistance.
- **Seal rinses:** Provide an additional protective layer, further enhancing adhesion and corrosion protection.

Each treatment option comes with different performance benefits and cost considerations. Choosing the correct process for the application is critical; inadequate preparation can result in premature coating failure, even if the coating itself is correctly applied and cured.

Powder coatings for aluminum are formulated using various resin systems, including epoxy, polyester, acrylic, and hybrid blends. Each resin type offers different levels of resistance to common stresses such as impact, UV exposure, and chemical contact. For instance:

- **Epoxy-based powders** provide excellent chemical and impact resistance, making them ideal for indoor use. However, they lack UV resistance and are not suitable for outdoor applications.
- **Polyester and acrylic-based powders** offer greater durability in outdoor environments, with improved resistance to sunlight and weathering.

Powder selection for indoor use is typically based on appearance requirements, performance specifications, and cost per square foot. Notably, outdoor-durable powders can also be used in indoor applications, offering a broader range of protection and performance available.

Old Yeller

We've recently encountered intermittent discoloration or yellowing on parts, and despite our efforts, we've been unable to identify the cause or determine when it occurs. Could you provide possible explanations for this issue and recommend corrective actions?

If you're experiencing yellowing, it's often due to overbaking during the curing process—this is especially common with white or lighter-colored powders. Excess time or temperature will cause oxidation of powder material. While most powders are formulated with approximately 100% overbake protection, some are more prone to discoloration.

Have you recently run an oven profile or curing curve test? This can help determine whether your process is exceeding the recommended cure parameters for your specific powder. In some cases, yellowing may occur only on parts left in the oven during break periods, when exposure time unintentionally increases. Another potential possibility is if you have lighter gauge metals being cured along with heavy structural parts. The lighter gauge areas can become overbaked.

It's also worth checking your oven's exhaust fan volume against the original specifications. Inadequate exhaust can lead to a buildup of amines and other byproducts released during curing, which may contribute to discoloration.

Additionally, is the issue isolated to a particular powder or manufacturer? If so, please reach out to them for more targeted support.

Bare Necessities

Our company is planning to apply a powder topcoat over parts that have already been coated with electrodeposition (e-coat). We have a conveyorized powder coating line where the parts will be hung. Although the conveyor system is grounded, I'm concerned about whether there will be sufficient grounding through the e-coat to ensure proper adhesion of the powder coating. Do we need to remove some of the existing e-coat to create bare metal spots for the hooks to ensure adequate grounding? Or will the current grounding setup be sufficient for the powder coating process?

The parts that have been e-coated do present slightly less grounding than raw metal parts. However, since the e-coat layer is relatively thin (a few tenths of a mil), it typically provides sufficient grounding to attract the powder coating topcoat effectively. Use a megohmmeter to verify you have a good ground (less than one megohm) when you hang your parts. There is no need to scratch or remove the existing e-coat, as doing so could create potential corrosion points. Powder coating on top of e-coat has been successfully implemented in the industry for many years. The grounding through the e-coat is generally adequate for the powder coating process, so your current setup should work well.

CAN You Hear Me Now

After resetting my gun control unit, I started experiencing frequent error codes and a high error rate during data transmission and reception. What could be causing this, and how can I resolve it?

This error type typically indicates a communication failure between a control unit and the CAN (Controller Area Network) bus, which connects gun control units to the master control computer in most machinery. The issue may stem from a few different sources.

- A disconnected or malfunctioning CAN bus cable.
- CAN bus networks require terminating resistors (typically 120 ohms) at the ends of the bus to prevent signal reflections. If these are missing, incorrect, or improperly placed, it can lead to communication errors.
- All devices on the CAN bus must operate at the same baud rate. If devices are using different baud rates, it can cause communication errors.
- External noise sources (e.g., electromagnetic interference) can interfere with the CAN bus signals, especially if the wiring is not properly shielded or routed away from potential noise sources.

If the error persists, it is strongly recommended to contact the powder gun manufacturer's service technician.

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