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Ask Joe Powder

Rust in Peace

Q Hey Joe:

I am looking at a report that a major company just sent in. The steel parts are showing signs of rust after 24 hours and visible signs of rust after 48 hours in a 5% salt fog solution.

Somewhat new to this world of powder coating – how is this possible? Some holes and slots that have been punched out I can somewhat understand. But when I see aluminum wheels and outdoor items holding up season after season I would have thought the powder coating would hold up longer?

Is there a method of correlation between hours in a salt chamber and what this means to user conditions?

Thanks.

John D

A Hi John,

A properly applied and cured powder coating should last significantly longer than this. Metal cleaning and pretreatment is critical, as is complete coverage. This means the metal must be completely clean – no dirt, oil, fingerprints, etc. Furthermore, a suitable pretreatment must be employed. This can be as simple as a thorough media blast or as complex as a multi-stage phosphate or zirconium/silane process.

Expected field exposure dictates the degree of pretreating necessary. Also, if the powder coating isn't completely cured, it will not have the necessary barrier properties to thwart the invasion of water and salt ions through the coating.

Incomplete coverage is an obvious no-no. Standard polyesters should give you a couple years of durability before showing signs of corrosion. Epoxies are significantly better; however, they fade in the sunlight. Hence the best coating systems are comprised of a killer cleaning/pretreatment process followed by an epoxy primer, then an outdoor durable polyester (or even better, a fluoropolymer).

As for correlating salt spray performance to predicting outdoor durability – it's a tricky proposition. Typically, most powders will go 500 hours in a salt fog cabinet before exhibiting any rust. I would guess this equates to somewhere around 18 to 24 months in a continental climate. Coastal environments are much more brutal and harder to correlate. A good epoxy over a good substrate will go 1500 to 2000 hours in salt fog.

I think you have a metal prep and/or process condition problem. Have you checked solvent resistance (an indicator of cure) and film thickness? Let me know, I can offer some suggestions.

Best regards,

– Joe Powder

Oils and Soils

Q Afternoon Joe,

I had a question about powder coating. What is the best powder coating primer to use as a base coat on outdoor iron fencing rails?

We use zinc rich primer as our base and then apply gloss black as a top coat, but the top coat and base are starting to peel off.

Thank you,

Joel M.

Sales/Plant Manager

Gema

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Powder Coating Technology

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A Morning Joel,
 This sounds like a serious problem. Using a zinc primer should be okay as your base coat (aka primer) as long as it's processed properly. Please ensure that the iron rails are properly prepared before applying the primer. By proper preparation, I am referring to first removing all "oils and soils," then preparing the metal for the best adhesion of the primer. The O&S can be removed by solvent wipe (acetone works well) or alkaline cleaner followed by a clean water rinse. Pretreating the metal is next and can be accomplished by media blasting (remember to use only clean media) or a chemical pretreatment such as iron phosphate or zirconium/silane solution. Clean rinsing with deionized water or water processed through reverse osmosis is recommended to ensure the best surface for the primer to adhere to.

After applying the primer, it is wise to partially cure or "gel" the powder. The best topcoat adhesion is achieved over an incompletely cured primer. So reduce the recommended primer bake time by 50% and proceed to topcoating. Bake the topcoated rails per the recommended powder bake as disclosed on the Product Data Sheet provided by your powder supplier.

If you're still having adhesion issues after following the recommendations above, then I would switch to a non-zinc primer. They work as well as most zinc-rich types and are much easier to spray. In addition, you get significantly more coverage per pound of powder because the specific gravity of a non-zinc primer is considerably lower than that of the zinc rich material. We've seen excellent corrosion resistance of the newer non-zinc primers in our laboratory. Remember that clean, well pretreated metal is essential, as is a partial cure of the primer for optimal intercoat adhesion.

Best of luck,

— 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!