



ASK JOE POWDER

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Our popular Ask Joe Powder blog has made its way to the pages of PCI magazine. What are your powder coating questions and challenges? Joe Powder, aka Kevin Biller of ChemQuest Powder Coating Research, shares his powder coating knowledge and expertise by answering questions sent in from around the world.

Dear Mr. Joe Powder,

Is there any way to reduce the hardness for powder coating? We are using a polyester resin for a powder coating with a pencil hardness of 3H. However, our customer requires 1H hardness. Looking forward to hearing from you.

Thanks and best regards,

*Ms. Ngoc Tu Nguyen
Vung Tau Province, Vietnam*

Dear Ms. Tu Nguyen,

It is very nice to hear from you again. Yes, you can reduce the hardness of a polyester powder coating through adjusting the formulation. Basically, you can do this by reducing the crosslink density (distance between chemical bonds in the cured powder). This can be done by switching to a carboxyl polyester that has a lower acid value. Traditional polyesters designed for TGIC or HAA have acid values around 30-35. Switching to a polyester with an acid value of 20-25 will require less crosslinker (TGIC or HAA). This will reduce the pencil hardness. Please be aware that this will also reduce the chemical resistance and probably the corrosion resistance. So be careful when making this formulation adjustment.

Another way to reduce the crosslink density and hence the pencil hardness is to simply reduce the crosslinker level (TGIC or HAA). Traditional polyester TGIC

powders are formulated at a 93:7 ratio (PE to TGIC) and HAA polyesters at a 95:5 ratio (PE to HAA). Reducing the crosslinkers to 94:6 (TGIC) or 96:4 (HAA) will reduce the pencil hardness. Again, the coating will not be as robust for chemical resistance and corrosion resistance.

Furthermore, "superdurable" polyesters are inherently harder than standard durable polyesters. So, if you are using a "superdurable" grade polyester, replacing it with a standard grade will lower the pencil hardness, probably one pencil.

Choice of mineral filler also affects pencil hardness. If you have a mineral filler in the formulation, check to see what the Mohs hardness is. If it is over 5.0 you may want to change it to calcium carbonate (3.0) or barium sulfate (3.5). This will reduce the pencil hardness a little.

I hope that this helps, Ms. Tu Nguyen.

Kind regards,

Mr. Joe Powder

Hey Joe,

Over a three-month period, we have had a condition with our powder coating system, where our part film thickness readings decreased. We have tried to increase the automatic guns' powder output, in hopes that the part film thickness would increase. Although increasing the automatic guns' powder output does

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not increase the mil thickness, this problem does not happen all the time. I have listed things we have tried to resolve the problem:

1. We checked and repaired all automatic guns (pumps, inserts, automatic gun function test and system grounding test) no problems were found.
2. We sent powder samples to be analyzed by the powder paint manufacturer. The powder paint manufacturer concluded that there were no problems found with powder paint samples sent to them. The test performed were particle sizes analysis and dry-flow powder paint testing.
3. Part hangers and hooks, no large amounts of powder build up present.
4. Our part thickness has decreased from the acceptable powder thickness range of 2.0 to 4.0 mils, to the unacceptable part thickness range of 1.0 to 3.0 mils.

Any help resolving this problem would be greatly appreciated. Thank you for your time.

Mike Buller

*Industrial Engineering Technician
Canajoharie, NY*

Hi Mike,

Sounds like a very perplexing problem. You mentioned that you checked the automatic guns. Did you check the voltage / current output of each gun? Have you also checked your line speed? Does it fluctuate?

Another test is to measure is actual powder output of your guns. Secure a vacuum cleaner bag to each gun (a rubber band will suffice) and trigger the gun for 30 seconds. Weigh the powder collected for each gun. The difference should be within 5% of each gun. Another place to look is the ratio of reclaim to virgin powder being introduced to the guns. Reclaim powder (overspray) has lower transfer efficiency than virgin powder. I recommend that you keep the reclaim to virgin ratio below 25% reclaim.

I would also be inquisitive with the conclusions drawn by your powder supplier regarding particle size. What type of data did they give you? Was it for a number of boxes? Was it an average of many measurements? Was it for more than one batch? It is helpful to see the entire range of particle size data for a number of boxes (or drums). This includes average (or median) particle size, percentage below 10 microns and percentage above 90 microns. A high level of fines (> 7% below 10 microns) causes poor transfer efficiency. Have you measured the particle size of your reclaim/virgin mix of powder? Is there a high level of fines in that mixture?

I think that a variation in particle distribution may be the cause of the decline in film build on your parts.

Please let me know if any of these suggestions help.

Good luck,

Joe

Do you have a question for Joe Powder?

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