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# Ask Joe Powder

## It's Snow Joke!

**Q** Dear Joe,  
One of my customers in Thailand is facing an unknown problem when they use the polyester product.

The coated pieces have an aluminum profile and their application is vertical. The unknown compound is similar to snow and mostly found inside the baking oven and is the cause of defects on the coated surface. It seems to happen from my powder and is the usual condition at the customer's line oven, in my opinion. Can you advise from your experience what it is and how it happens?

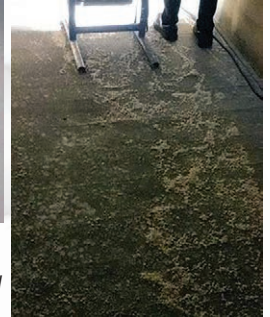
Thank you in advice,  
Pongbodin D.  
Thailand

**A** Dear Pongbodin,  
Thank you for your question. I have seen this problem before. It can be summed up in one word: benzoin. Nearly all powder coating formulas use a degassing agent to assist in film formation of the coating while it is melting in the oven. Degassing is needed because as the particles coalesce, air pockets form in between the particles (I like to call it interstitial air). Incorporating benzoin allows the bubbles to escape during this melt phase. Sounds great so far. Part of the mechanism of degassing involves the volatilization of the benzoin as its melting point is 270°F (132°C) and it tends to

sublime above this temperature. How do we know this? I have taken samples of the snowflake-like residue found in powder cure ovens and had our analytical lab characterize it. What they found was that the majority of the residue is benzoin.



*Above: Here, you can see defects experienced in the powder coating finish from the oven residues.*



*Right: Here, snowflake-like residue has accumulated in the customer's oven.*

So, how do you minimize/stop this problem? My experience with finding high concentrations of benzoin in a cure oven usually indicated a very "tight" oven. By that, I mean an oven with very little exhaust. This is a common issue as some oven designers think that since powder coatings are promoted as having no volatile organic compounds (VOCs), they do not have any volatiles. This is not the case. VOCs refer to regulated organic compounds that present a deleterious effect on the atmosphere. Powder volatiles do not, but they still exist. Hence the solution to your problem is to 1.) thoroughly clean/vacuum your oven and 2.) provide more exhaust to the oven. This should eliminate the problem.

Oh, and one other thing, have a trusted analytical laboratory analyze the residue with infrared spectroscopy. Benzoin absorption bands are unmistakable.

Best regards and let me know if you have further questions.

*- Joe Powder*

## Quest for a Cure

**Q** Good Day Joe,  
Please assist if you can. In South Africa it is very difficult and very expensive to get piped gas into my plant. We are starting up a powder coating section for architectural extrusions. I would like to get some input as to whether I should select my

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ovens to be gas/diesel or infrared (IR). Is there a strengths, weaknesses, opportunities and threats (SWOT) analysis that has been done to determine the best options?

Regards and thank you in anticipation.

Belinda R.

Johannesburg, South Africa

**A** Good day, Belinda,

This is a very common problem in the African continent. We ran into a similar problem in Nairobi. The coating operation there could either pay for gas lines to be laid to their plant (cost prohibitive and would take an indeterminate amount of time for installation) or install a large gas storage tank and buy a year's worth of gas (also cost-prohibitive). They elected to use electric resistance heating for their finishing line. I felt this was the lowest cost option for capital expenditure, however operating costs are quite high.

For your situation, I recommend a combination of IR and electric resistance heat. The IR will have to be electric as opposed to gas-fired or gas-catalytic IR for the reasons you mention above. I think it will be best to use a medium- to long-wavelength IR system as it provides better heat-up consistency and is less

sensitive to coating color differences as compared to short wavelength types. It is important to orient the elements so they do not cause "striping" from localized focal points of IR energy. IR energy is relatively "line-of-sight" and will preferentially heat up the surfaces it "sees" (lots of quotations today). Because of this localized delivery of heat, it is wise to follow the IR zones with convection heat, in your case resistance electric. Convection heat will even out the overall temperature of your parts and is "color-blind," as opposed to IR. This way you can be assured of thorough, even cure across your parts.

I would avoid diesel-fueled ovens. They are rather inexpensive to purchase and operate, however the combustion is not as clean as that of natural gas and can cause inconsistencies in color. If your target market was less critical than architectural, you could contemplate using a diesel fueled oven, but I don't think this is an option for you.

I hope that this helps you in your quest for a curing system for your powder coating shop. Good luck and let me know if you have any further queries.

— Joe Powder

*Joe Powder is our technical editor, Kevin Biller. Please send your questions and comments to Joe Powder at [askjoepowder@yahoo.com](mailto:askjoepowder@yahoo.com).*

**Editor's Note:** Letters to and responses from Joe Powder have been edited for space and style.