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Guest Column

Liquid to powder conversion: How much of your existing equipment can you use?

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There has been much discussion on this topic over the years. I'm sure I've written something on this in the past, as well. However, it never hurts to take a fresh look at this important discussion, as many people still have to reconcile how to convert to powder coatings in the most economical way. This goal often requires using as much of the existing finishing equipment as possible to minimize the capital investment. Replacement of the entire finishing process, which has its own set of issues, is not what's discussed here. Instead, the article organizes the evaluation of an existing liquid paint process conversion to powder coating in easy-to-swallow bites.

What are your goals for converting to powder?

Starting with an honest and open discussion of what you expect to achieve with your conversion to powder coating is the first agenda item. All other discussions and equipment evaluations originate from this start-

ing point, and solutions need to be measured to these objectives to ensure a successful conversion project. There may be some reasons for conversion that are more specific to your situation, but the following reasons are the most universal that I've seen over the years. I've included definitions and discussions that correspond with these conversion goals while trying to use most all of your existing system components:

Economics/cost savings. The hard reality is that if your primary goal to convert to powder coating is based upon economics, you have limited opportunities to save by using your existing equipment. The primary areas where possible cost savings occur are material savings (powder versus liquid paint material costs), energy savings, manpower reduction, reduced product defects, and lower maintenance costs.

Material savings can be significant if you currently purchase an expensive liquid coating and reducing sol-

vent. However, if your liquid coating is fairly priced, this area for savings may be limited. Considering that most of your existing liquid equipment is still going to be used to support a powder process, finding areas to reduce energy costs are limited to make-up air requirements for the spray booth and reduced cure oven exhaust. However, in most cases the cure oven has to operate at a higher temperature to cure powder than to cure/dry liquid, often offsetting potential cost savings from reduced oven exhaust requirements. Of course, eliminating heated booth make-up air systems can save significant money, but if you currently operate with an open window or door for your make-up supply, there is no cost savings here either.

Without significantly changing the method of applying the coating (that is, using automation), finding areas to reduce manpower can also be difficult, especially if you plan on reusing the powder overspray without a "fast color change" booth system. In this case, you may actually use more manpower than liquid, since color change without the "fast change" systems can take significantly longer than performing a color change with liquid paint. Reducing product paint defects is almost guaranteed when you convert to powder coating. All you have to do is determine what the value is of this reduced defect rate.

Powder systems require significantly less maintenance than liquid systems, and their spare parts are frequently cheaper as well. The only area where powder coating parts is more expensive than liquid coating parts is the booth filters. The good news is that powder filters often last more than a year, so you'll be changing them less often and using fewer filters. Finally, disposal costs, another often overlooked maintenance cost, is significantly cheaper with powder than with liquid, as most waste is classified as landfill material. Performing a detailed operational cost comparison analysis will identify the areas where

your cost savings are and establish their value. A variety of tools are available on the internet for just this purpose.

Improved finish properties. Most powder formulas have improved mechanical and corrosion properties compared with most liquid coatings. Performing a side-by-side comparison of all the performance properties for both coatings will highlight what and how much these improved properties are for the selected coatings. However, be aware that most powder coating properties are only developed after fully curing the coating. This puts significant pressure on the performance of the cure oven. Furthermore, improved corrosion resistance is as much a function of improved pre-treatment as it is a function of coating formulation. Therefore, unless you're looking to improve your current pre-treatment method, you may not obtain the desired corrosion protection by just making a change from liquid to powder.

New customer demands/requirements. This is often a slam dunk issue when converting to powder from liquid, as you have no choice but to change the coating on your product to meet your customer's requirements. However, it can still be less expensive to send these parts out to powder job shops for coating than to upgrade your process to coat them in house. This choice can be preferable if these customer quantities are a fairly small percentage of your total production volume. However, if this request appears to be a trend that's gaining momentum or the volume is significant, then changing your process to powder is your only choice, no matter the costs.

Environmental concerns. Converting to powder may seem the obvious answer to this problem. However, changing to a higher-solids paint or waterborne paint may be effective enough to reduce your volatile organic compound (VOC) output below mandated levels without changing your spray or booth equipment very much beyond new guns, pumps, and possibly charging systems (isolators).

Operating efficiency improvements. Most of these efficiencies will be highlighted when you perform the operational cost comparison analysis. However, converting from a manual spray liquid application to an automatic spray powder application can obviously reduce manpower and improve efficiency. You should ask yourself the question: "Can I obtain the same effi-

ciency improvements by adding automation to my liquid process?"

Worn-out existing equipment. While this is the perfect excuse to change over to powder, can you do it cheaper by staying with liquid coatings? However, do not pass up this opportunity to obtain benefits from all the other reasons to convert to powder.



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Can your existing equipment support a conversion to powder coating?

Assessing if your current system components can support your desire to convert to powder coatings can be fairly straightforward. The only issue that can complicate this evaluation is if you're also looking to improve your coating performance (especially corrosion performance). For this article, we'll assume that you're not improving your corrosion protection significantly, which could require modification to the pretreatment system or a change in pretreatment chemistry.

Pretreatment. Because powder coatings have no solvent to help bite through residual soils on the part surface, you need to ensure that your product is clean after pretreatment. The two methods to judge a sufficiently clean part are water-break-free and white-towel testing. Verify that parts exiting your pretreatment system meet both these conditions and that you've met the minimum threshold for part cleanliness to support powder coating. If you apply a conversion coating in your pretreatment system, that is, iron phosphate, chrome phosphate, and so on, verify that this coating is evenly applied without significant streaking.

Dry-off oven. Evaluating this equipment is easy. All you have to do is verify that the parts are dry when they exit the oven. If so, you're good to go.

Part temperature at time of spray. Now that the parts are clean and dried, they should be below 100°F at time of powder spray to best control powder thickness. This doesn't mean that you can't apply powder when the part is hotter than this. In fact, any temperature below 250°F (powder melt temperature) won't adversely affect the spray application process. It's just much easier to control film thickness from day to day with cooler parts.

Part ground at time of spray. Proper part ground is important for

both safety and spray efficiency in a powder system. Measure the earth ground on the part to verify that it's less than 1.0 megohm resistance.

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Cure oven profile. Never upgrade a liquid system to powder without first carefully evaluating the cure oven through the use of a profile system. This test equipment uses thermocouples directly applied to the part and measures metal temperature while the part traverses through the oven. A plot graph of part and air temperature over time is produced when this device is used in connection with analysis computer software. The resultant curve must show that the part has attained the desired metal temperature for the prescribed time to cure the intended powder coating.

Velocity of cure oven entrance air seal. Make sure the cure oven entrance seal is not blowing air at a velocity so high that it displaces the powder on the part before it has had a chance to melt and flow onto the surface. Changing the direction of this airflow will still allow for effective heat sealing and yet ensure that the air doesn't directly wash the part surface.

Part temperature at time of unload. The part temperature needs to be below 250°F, the glass transition temperature (T_g), at the unload area; otherwise, the powder surface could still be "tacky." Soft or "tacky" part surfaces will ensure handling defects in high appearance parts.

Conveyor height at the powder booth location. Considering most powder booths have ductwork, fans, or other equipment under the booth, the booth floor is often 3 feet,

or more, above the floor of the plant. Therefore, you need to ensure that you can locate your conveyor high enough in this area to allow for the installation of the powder booth and still process your tallest part. The easiest way to do this is to determine the "clear-span" height. This is the vertical dimension from the plant floor to the lowest overhead obstruction. Using this dimension, subtract the "top of part to top of conveyor rail" dimension, the part height, the booth base height (more than 3 feet), and at least 12 inches of clearance (6 inches top and 6 inches bottom). If you end up with a negative number, then this is a problem. Otherwise, you're good to go.

Plant air space cleanliness surrounding the new powder booth location. If you plan to reclaim the overspray powder for reuse, the surrounding plant air space must be clean and airborne-contaminant-free. If you plan on having a spray-to-waste powder system or installing an environmental room as part of your conversion, then you don't have to sweat this one.

Plant drafts in the powder booth location. Extraneous plant drafts and open loading dock or personnel doors will wreak havoc with a powder booth. If you have these issues, consider using an environmental room to isolate your new powder booth.

Summary

I hope the information contained in this short article about a complex subject sheds some light on what issues need to be checked before converting an existing liquid system to a powder coating operation. Starting your conversion evaluation with clear goals is the best way to ensuring you're happy when you complete the project. These goals will also influence the importance of the equipment checks outlined here. This information isn't exhaustive but rather hits most of

the high points you must consider in this type of project. Our company provides these services and evaluations to clients worldwide, so give us a call if you need help.

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Editor's note

For further reading, see the "Index to Articles and Authors 1990-2010," Reference and Buyer's Resource Issue, *Powder Coating*, vol. 21, no. 7 (December 2010), or click on the Article Index at [www.pcoating.com]. Article can be bought online. Have a question? Click on Problem Solving to submit one.

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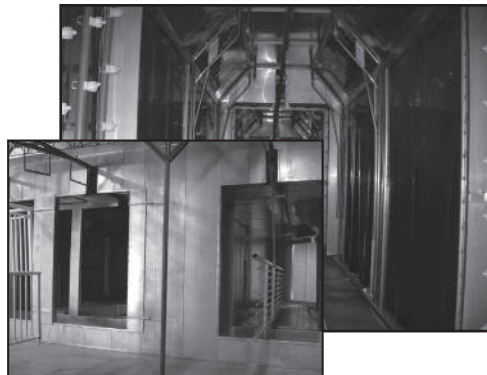
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