Get the powder on the part and not in the reclaim

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Though it is unpleasant to admit, some liquid application systems are more efficient than powder systems. The liquid disk applicator is a case in point: Densely racked parts travel through an omega-shaped booth, surrounding the disk applicator almost entirely. The high electrostatic charge on the paint, combined with the disk's ability to spray all the parts around it, gives the disk system a transfer efficiency approaching 95+ percent.

What would it mean if first-pass transfer efficiency of this magnitude were a reality for powder systems? It would amount to nothing less than a transformation of the place powder holds within the finishing industry for the following reasons: Color change would be simple, fast, and most importantly, competitive with liquid color change. Application problems that result from changes in reclaim particle-size distribution would be eliminated, resulting in improved finishing quality. Recovery equipment would be smaller and less expensive, which could encourage more conversions from liquid to powder.

To improve the standing of powder within the finishing industry, systems designers, equipment vendors, end users, and consultants need to concentrate on achieving the highest possible first-pass transfer efficiency and forget for a while that overspray can be reclaimed. Here are some likely consequences of taking this approach in designing and operating powder systems:

**System efficiency.** At the highest levels of first-pass transfer efficiency, almost all the powder sprayed is deposited on the part. The overspray, amounting to less than 10 percent of the sprayed powder, can be collected for scrap only. No reason then exists for calculating or measuring reclaim or total powder utilization. This will put powder application systems on equal footing with liquid systems.

**Recovery design.** When the amount of overspray is reduced, higher air-to-cloth ratios can be used in sizing the collection system. As a result, smaller, less expensive collection systems are required. In addition, when overspray is collected for disposal, sieves can be eliminated.

**Color change.** When overspray is collected for disposal only, no reason exists for using recovery systems with color-change designs (such as cyclones and additional cartridge modules). Color-change cleanup can be limited to the booth, feed system, hoses, and application guns, reducing color-change time. Higher transfer efficiency further reduces color-change time because the more powder that gets on the parts, the less powder there is to remove from booth walls.

A drastic reduction in color-change time is a necessity if powder is to move into certain markets. For example, in liquid automotive finishing, an 8-second color change is required. This is accomplished by flushing the feed line with solvent and using a color-change unit to switch to another color. If oversprayed powder is scrapped, powder systems can follow the same procedure, using compressed air instead of solvent.

**Maintenance.** High transfer efficiency reduces maintenance costs in the following ways: When powder is attracted to the parts and not the hangers, hangers require less frequent cleaning. When powder overspray is reduced, filters in the collection system work less and last longer. When overspray is not recovered, spare parts consumption and equipment downtime are greatly reduced because sieves, air locks, cartridge modules, cyclones, and transfer hoppers and pumps are not used.

**Economics.** At first glance, throwing oversprayed powder away hardly seems like a great economic boon for end users. But, by increasing
first-pass transfer efficiency and scraping the overspray, end users can reap the following benefits:

- Lower maintenance costs in general and lower hanger-maintenance costs in particular
- Less spare parts use
- Reduced cleanup time
- Less fresh powder use
- Lower initial system cost (the result of using simplified recovery systems)
- Lower utility cost (the result of using less equipment)

Together, these benefits can probably offset the cost of disposing of the oversprayed powder, as long as first-pass transfer efficiency is high enough.

Steps to higher first-pass transfer efficiency

This all may sound too good to be true—a powder coating utopia. Maybe 95+ percent first-pass transfer efficiency is not likely in the immediate future. Even so, if certain principles are adhered to in designing and operating powder coating systems, the amount of powder to be recovered can be reduced. To do this, system designers, equipment vendors, end users, and consultants have to adopt a radical philosophy: Get the powder on the part first and recover the overspray last! Here is how it can be done:

Part racking and hanging. This is primarily the responsibility of the end user. Parts should be racked as densely as possible. Hangers should be designed to be less appealing targets to the powder than the parts are. Parts need to be presented in the best position for efficient coating and part ground must be maintained at all times.

Application equipment. System designers need to select application equipment appropriate for the job and configure it into an efficient system. For instance, most applications call for using round spray nozzles because they produce even powder buildup. When penetration into a part is required, however, the system designer should specify flat spray nozzles. The designer will need to conduct tests to determine whether corona- or tribo-charging guns best suit the application. Sometimes it's necessary to use tribo and corona guns in combination.

The designer should decide between using fixed guns or gun motion devices; some applications require the use of both. Though the goal is to get the powder to the intended areas with the least amount of equipment, sometimes using more guns at lower powder outputs is more efficient than using fewer guns with higher outputs. Automatic gun triggering can be used to turn off guns that are not needed when shorter parts are coated or to turn off all guns when line gaps occur. To get the most out of the application system, end users need to operate and maintain all application equipment properly.

Powder booth. The system designer should design the booth with acceptable internal drafting so that it will capture the overspray without interfering with the coating operation. Turbulent airflows interfere with coating and cannot be tolerated. The internal draft in the coating area should be approximately 65 fpm.

A booth constructed of approved nonmetallic materials will ensure that the powder is attracted to the part and not to the booth structure. The internal dimensions of the booth should be sized not only for proper draft but also for correct gun-to-wall dimensions. This will help increase first-pass transfer efficiency in booths with metallic walls.

Operation. If the operator cannot see through the booth when parts are being coated, the gun outputs are probably too high. When application equipment is designed properly and functioning correctly, defined patterns that show the powder being attracted to the parts are visible. The presence of undefined powder clouds, which result from high powder output and excessive overspray, cannot be tolerated. Maintaining the proper powder output is the responsibility of the end user, not the equipment manufacturer. Training, combined with consistent supervision, will ensure that efficient powder output is maintained.

Conclusion

As equipment development continues, end users will have more chances to achieve the ideal efficiency of 95+ percent. In the meantime, if system designers and equipment vendors select equipment well suited to the application and configure it into an efficient system, and end users operate the system properly, some of the benefits of high first-pass transfer efficiency can be realized now. The results will be that end users will be on the way to higher profitability, and the powder coating industry will be headed toward further expansion.

Endnotes

[Editor's note: The following articles contain information that can help system designers and end users increase first-pass transfer efficiency.]