

## NICK'S NICHE

Guest Column

# Five things you can do to improve your transfer efficiency

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This topic has been covered in many forms in the past, by me and by others. However, I thought that a concise checklist approach to what most powder coaters struggle with every day — How to reduce powder overspray/scrap and increase efficiency — could be useful. This way, you can cut this article out of the magazine and laminate it right onto your spray booth for all to see and follow.

## The basics

Let's start with the scientific theory part of the discussion as the basis for the checklist discussion to follow. Powder particles are attracted to grounded part surfaces by the electrostatic charge imparted on them by the gun; the higher the charge on the powder particle, the better the transfer efficiency. In corona charging systems, the amount of charge on the particle is explained by the formula in Figure 1.

Notice that some factors are more important than others. For instance, electrostatic field strength is directly

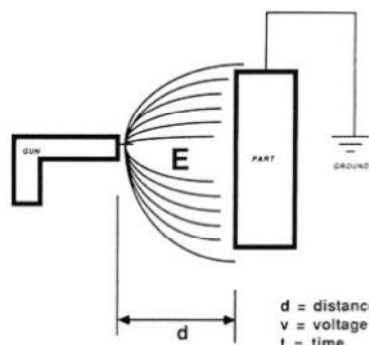
proportional to applicator electrode voltage. Also, the distance between the part and the applicator (sometimes called the target distance) will directly affect electrostatic field strength.

The charge on the powder particle (which causes the attraction) is most affected by the amount of time the particle is in the field (by its square).

### FIGURE 1

#### Formula for determining the amount of charge on the particle in corona charging systems

Field Strength:  $E = V/d$   
 Charge on Particle:  $Q = 1/2 CEt^2$



The time and field strength will determine how much powder is attracted to the part (i.e., first-pass transfer efficiency). The time the powder particle is within the electrostatic field is most easily controlled by adjusting the velocity of the powder pumped through the gun and reducing the speed of the applicator motion. It is a known fact that systems that use reduced powder velocity and slow gun motion will provide the best coating efficiency with the least effort.

## The five keys to improving first-pass transfer efficiency

Now that you understand the science behind how the corona electrostatic gun works, we can explore how to perform practical everyday techniques to improve first-pass transfer efficiency. These techniques apply to both automatic and manual applications.

**1. Gun Voltage:** Always start with the highest voltage settings your gun can accommodate to obtain the best first-pass transfer efficiency. You may have to back off this maximum voltage setting if you have difficulties with Faraday Cage areas or experience electrostatic rejection issues (starring) with thicker film builds. Some equipment may allow you to control the current output to reduce the cause of these problems, as well.

**2. Part Ground:** Verify that your part ground is  $\leq 1$  megohm resistance to electrical ground. This not only ensures that you are operating safely in accordance with NFPA #33 guidelines, but it will reduce the problems with Faraday Cage areas and electrostatic rejection, discussed above, and allow you to operate the gun at the highest possible voltage setting.

**3. Gun Target Distance:** The spray gun should be between 6 inches and 12 inches from the part to provide the best transfer efficiency. Theoretically, you can improve transfer efficiency by using the gun closer than 6 inches, but often the aerodynamics of the powder around the gun spray pattern

device will disrupt the electrostatic attraction forces and cause the opposite effect.

**4. Powder Particle Speed:** The faster the particle travels, the less time it is within the electrostatic field and the lower the first-pass transfer efficiency. Reducing powder output velocity, using gentle gun pattern devices, and slowing gun motion all play an important role in reducing the powder particle speed. Remember that the time the powder particle is within the electrostatic field is the single most important parameter to improving transfer efficiency. *Speed kills!*

**5. Part Orientation:** Position the primary coating surfaces towards the automatic guns or the manual sprayers to ensure optimum coating results. Proper part orientation will ensure that the spray gun can more easily coat the surface without wasted effort. Wasted effort always results in poor transfer efficiency as you cannot adequately apply the

previously mentioned principles while coating the part.

### Summary

Well, there it is, five easy steps that you can implement today to improve your first-pass transfer efficiency. Remember, if you get the powder on the part efficiently, you will generate less overspray. This will mean you will scrap less powder in spray-to-waste operations and keep virgin-to-reclaim ratios within the ideal 70/30 percent range in reclaim systems. Overall, your process and checkbook will thank you for implementing these five easy improvements. **PC**

### Editor's note

For further reading, see the "Index to Articles and Authors 1990-2012," Reference and Buyer's Resource Issue, *Powder Coating*, vol. 23 no. 6 (December 2012), or click on the Article Index at [www.pcoating.com](http://www.pcoating.com).

Articles can be purchased online. Have a question? Click on Problem Solving to submit one.

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