

## TECHNICAL BRIEF #11

# Particle Size Distribution

### BACKGROUND

Powder coatings are an assortment of various sized particles produced in a grinding process. The size of powder particles have a major influence on many properties including fluidity, charging, application, and the final film appearance.

### KEY PARTICLE SIZE VALUES

Four values are typically used to characterize the powder size distribution: D10, D50, D90, and D99. These values are points along the distribution curve as pictured in Figure 1. For example D10 is defined as the point on the distribution curve below which 10% of the particles fall (denoted by the green filled area labeled 10% in Figure 1). For this distribution, the D10 is 9.0 microns. D50, D90, and D99 are thus defined as the points along the distribution curve that fall below 50%, 90%, and 99% respectively.

These 4 points have a practical use. D10 is a measure of fines, D50 and D90 reveal the average and width of the distribution and D99 is sensitive to the presence of oversized particles.

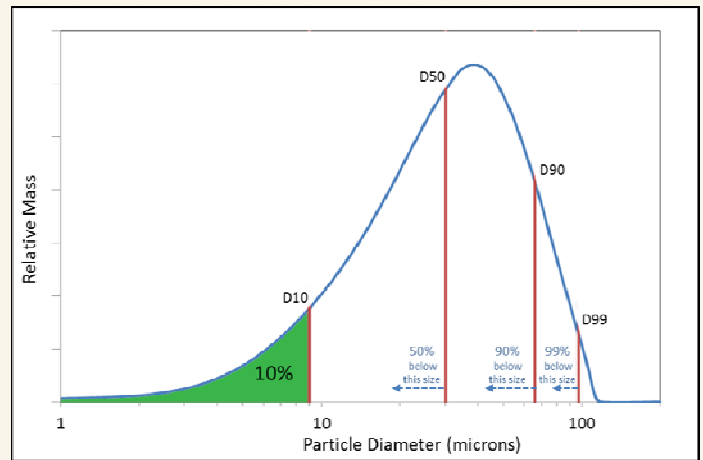


Figure 1: Particle Size Distribution

### PARTICLE PACKING

A broad particle distribution has a particular advantage over a more narrow distribution when applying a powder coating. A large variability in particle size results in an improved packing efficiency as illustrated in Figure 2. Small particles fill in the gaps between larger particles leading to a more uniform and smoother surface than is possible with a narrow distribution.

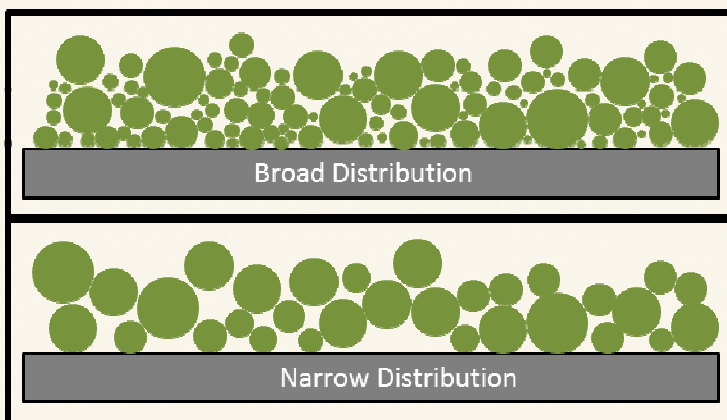


Figure 2: Packing Efficiency

### EFFECT OF SIZE DISTRIBUTION

**Small Average Size:** Advantages can include good wrap, packing density and smoother appearance. High levels of fines however can lead to poor fluidity, limited film build, and back ionization.

**Large Average Size:** Improved texture development and high film build are advantages. Disadvantages are higher orange peel and poor smoothness. Exceptionally large particles may fall off the substrate due to their high mass to charge ratio.

### CONCLUSION

The particle size distribution is a fundamental property of a powder coating. It influences both the application of the powder and appearance of the finished product. The size distribution for each powder coating is tuned to meet each customer's particular needs.