The Cost of Inefficiency

Application efficiency is a concept that consists of three basic components: finish quality, transfer efficiency (TE) and build efficiency (BE). To appreciate the significance of this concept, let's review the consequences of poor application efficiency. This can be done from both a production cost and environmental standpoint.

Finish Quality

Finish quality is the most critical aspect of application efficiency. Although difficult to quantify, the cost of an unacceptable finish is a worst-case scenario worth avoiding. The best of TE and BE numbers are worthless if the finish quality isn't there. An unacceptable finish means excessive production costs in terms of wasted time, material and energy on that workpiece. It also corresponds to higher waste disposal and maintenance costs. If rework is required, the entire process has to be repeated after spending a lot of time and effort getting the workpiece prepared for refinishing.

From an environmental perspective, poor finish quality correlates to excessive volatile organic compound (VOC) emissions and waste generation rates. Each time an unacceptable finish is applied to a part, the material sprayed only contributes to a business' emissions and overspray. This is compounded by any rework that needs to be performed. Consequently, there may be greater regulatory burden with respect to air permitting, hazardous waste management and environmental reporting.

TE and BE

Poor TE and BE contribute to high production costs because of excessive material consumption, waste disposal costs and maintenance. TE is the amount of coating deposited on the part compared to the amount sprayed. BE is a measure of how closely and consistently the mil build applied to a part meets your target dry film thickness.

Here's an example of what poor TE can do for you. Let's say that we are using a paint that costs $30 per gallon and contains four pounds of VOCs per gallon. That means a 55-gallon drum of material costs $1,650 and contains 220 pounds of VOCs. If the paint is applied at 70 percent TE (this is a pretty high number), 30 percent of the drum (16.5 gallons or $495 worth of product) is wasted as overspray and 66 pounds of VOCs are unnecessarily emitted into the atmosphere. At 40 percent TE (a more realistic number), 33 of the 55 gallons or $990 worth of material is wasted and 132 pounds of VOCs are unnecessarily emitted.

Now lets bring BE into the picture. Let's say that our target dry film thickness is two mils and we are applying it at 100 percent TE (not very realistic but it makes for easy math). If we actually apply 3 mils during the finishing process, our BE would be 150 percent. This means we're using 50 percent more material than what is needed and our VOC emissions are 50 percent higher than they should be.

The combined effect of poor TE and poor BE is the real kicker. Assume that it would theoretically take 100 gallons of the material described above to coat 1,000 parts at 100 percent TE and 100 percent BE. This would be equivalent to spending $3,000 on the material and emitting 400 pounds of VOCs. Now lets look at the cost of inefficiency.

Example #1

At a TE of 70 percent and a BE of 125 percent, 30 percent of the coating material would miss the target and we'd spray 25 percent more material than we actually need. At this rate, we would now need 179 gallons of paint to finish the 1,000 parts. Product cost would be $5,370 and 716 pounds of VOCs would be emitted.

Example #2

At a TE of 40 percent and a BE of 150 percent, 60 percent of the coating material would miss the target and we'd spray 50 percent more material than we actually need. We would now need 375 gallons of paint to finish the parts. Product cost would be $11,250 and 1,500 pounds of VOCs would be emitted.

As shown, the cumulative effect of poor TE and poor BE has a dramatic impact on material consumption and VOC emissions. The same applies for powder coating (minus the VOC emissions). Consequently, poor TE and BE numbers contribute to excessive production costs, higher air emissions, more maintenance and material handling, excessive hazardous and nonhazardous waste generation rates and a less than desirable employee work environment.