Clive Ashmore

How Mass-Imaging is Chaning Dispensing

Printing thousands of dots in a single stroke.

When Circuits Assembly asked me to pen a regular column on screen printing, I was honored. And, admittedly, challenged. Not because of the topic: I've been studying and applying materials deposition technology for years. But now I find myself with a new task: To provide you, the reader, with the most relevant, useful – and sometimes unconventional – information from a plethora of research and documented data. Since many readers are intimately familiar with traditional screen-printing technology, I'll discuss the latest advancements and newest applications, and hopefully provide solutions. This month: How high accuracy mass-imaging techniques are increasing manufacturing efficiency and changing the way manufacturers think about adhesive application.

But as today's placement systems push the limits of 100,000 components per hour, even the most sophisticated dispensing equipment has a hard time keeping up. Inevitably, the "b" word – bottleneck – rears its ugly head. Traditional dispensing is a serial process and, as each machine approaches its speed limit, the solution for improving throughput is to add more dispensers. In today's climate of cost control and space efficiency, this is not the optimal solution.

Enter mass-imaging technology. Essentially, any material that can be dispensed can also be imaged onto any substrate with any geometry in any type of carrier. By using a screen printer to deposit adhesives, significant improvements in throughput, resource utilization and cost reduction can be realized. Imagine printing hundreds of thousands of adhesive dots with one, precise stroke on a piece of equipment that can be readily redeployed for other processes, if necessary. This is the dramatic efficiency of mass imaging.

How can you print adhesive dots of varying heights and deal with the issue of clearance on populated boards? Read on.

Component clearance and dot height variance issues can be addressed by using a modified stencil. A thick, plastic 1-mm stencil is typically used to clear most common SMT components and a 3-mm stencil is required to provide clearance for through-hole components. In the case of taller obstructions (RF shields, partially assembled products, etc.), plastic stencils as thick as 8 mm have been used. Adjustments for obstacles on the printed side of the board are made by routing pockets onto the bottom side of the stencil, providing board stability and the flat surface necessary for printing.

Now, on to the challenge of printing variable dot heights. Solder-paste release characteristics can be calculated by ensuring a 0.66 or greater ratio of aperture area to stencil wall area. So, a thick stencil with a small aperture means that more paste adheres to the stencil wall and less paste is deposited on the board. The same holds true for printing adhesives with the thicker stencils described above: When aperture diameter is increased, large, tall dots of adhesive are deposited. When aperture diameter is decreased, smaller, low dots are produced (**Figure 1**). This results in the process control needed to produce varying dot heights and unlimited dot quantity with one stroke.

A final consideration is the tool that will be used to apply the adhesive material. While adhesive printing with conventional squeegees is possible, drawbacks include adhesive environmental exposure and the quantity of passes required to fill the thicker stencil before achieving the first good print. By using an enclosed print head, these squeegee problems can be eliminated (see M. O'Hanlon, "Applying Adhesives Accurately and Keeping Up the Pace", *SMT*, May 2002). Material is contained in a sealed cartridge and placed into the enclosed print head. This keeps the material from absorbing moisture or air and also extends its life, so less material is wasted. Second, the enclosed head, or direct imaging, technology uses internal pressure to apply force to the top of the material cassette or cartridge, generating material pressure completely independent of print speed. By eliminating the need for multiple print passes to fill the apertures, better process control is achieved. ■

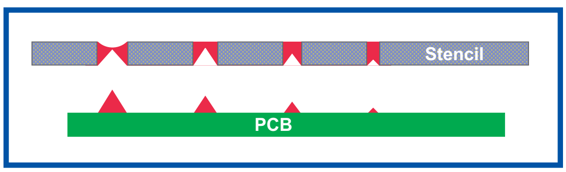

FIGURE 1: Smaller aperatures mean smaller dots.

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