

Integrated Offset Placement in Electronics Assembly Equipment — The Answer for Solder Paste Misalignment

By Geron Ryden

Growing demand for compact, multi-function electronics products has accelerated component miniaturization and high-density placement, creating new challenges for the electronics manufacturing industry. It is no longer adequate to simply place parts accurately per a pre-defined CAD assembly program because solder paste alignment errors are increasing for numerous reasons. The solution to this problem is a system in which the placement machine can automatically detect and compensate for misalignment of the solder paste to produce high-quality boards regardless of the process errors beforehand.

“The OPASS system we have developed ensures that our customers can achieve high first pass yields regardless of circuit pattern variations between board lots,” said Bob Black, CEO.

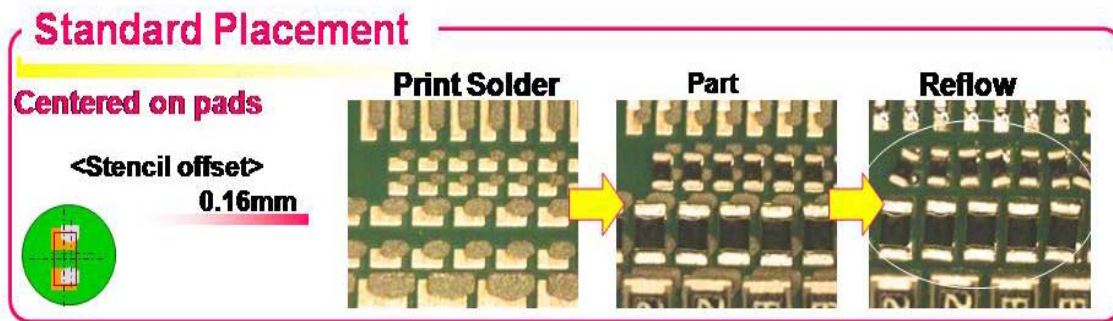
While board makers are striving to keep variations between lots to an absolute minimum, it is not possible for them to eliminate forward expansion and scaling completely. This means that the pads are not exactly in the same positions as they were on the previous lot. When the boards are fed into the stencil printer for solder paste there can be slight offsets from the solder paste print to the pad location. In larger parts that can be a very small percentage of the pad size, but in smaller parts like 01005, 0201 or even 0402 the solder could be halfway off of the pad.

Likewise with ceramic or flexible boards, the print repeatability can be difficult to achieve, which can cause further solder paste alignment problems. There also is cause for concern on double-sided boards because boards tend to contract after the first side reflow process. With the increased use of lead-free solder, the properties of the self-alignment effects have changed.

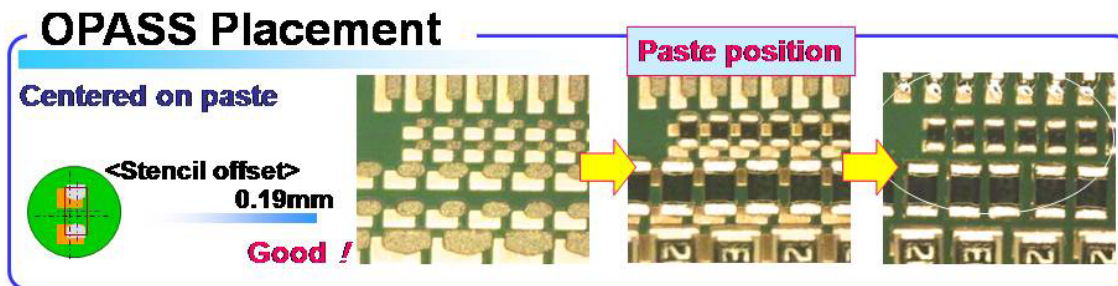
Through extensive research and cooperation with high-volume manufacturers, Juki has found that placing small components centered on the paste and not the pad will actually reduce the defect rate. Juki has developed a technology called OPASS, which stands for Offset Placement After Solder Screen Printing to address this problem.

In video comparison of the reflow process, it is clear that when smaller components are placed in the standard method of being centered on the pads regardless of the

solder paste location, as the solder paste wicks to the pads the components are randomly moved and often do not reflow properly (Figure 1).



In contrast, when using the OPASS system the placement machine determines the solder paste print offset and for selected components will place the parts centered on the paste and not on the pads as is typically done. During reflow, the components can be seen uniformly and predictably moving with the solder paste back to the pad location, resulting in far fewer defects. Studies have shown that OPASS is not effective for larger, heavier components or for most leaded or ball components, but is highly recommended for parts up to 0805 (Figure 2).



When OPASS is integrated into the electronics assembly machine, it eliminates the need for other equipment such as AOI machines to correct for solder paste alignment problems and provides a comprehensive solution to meet the future market trends of component miniaturization, high-density placement and lead-free assembly.

“The OPASS development shows Juki is a leading innovator in providing solutions in SMT assembly. While several competitors have announced links with solder paste inspection systems and AOI systems costing \$100K to \$150K to address this issue, only Juki has developed an in-machine solution costing less than \$15K,” continued Black. “This is an example of how Juki delivers the lowest cost of ownership to customers.”

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