Fixture Design for SMT Throughput

The SMT throughput was greatly increased due to clever fixture design.

A traditional SMT process requires each side to travel down the line independently. In other words, each board will encounter two reflow cycles, one for each side. A complete reflow cycle typically takes anywhere from 6 to 8 minutes. The processing time required for both sides is 12-16 minutes plus however long it takes to print the solder paste, mount the parts, and convey the boards. If the traditional process was used, a run of 10,000 boards would take about 22 hours to complete.

This fixture enabled us to go with a modified process. Since the product only had SMT components on one side, we were able to stencil print the first side, flip the boards so that the paste solder is on the bottom, then print the second side and continue with the process. This enabled us to skip a reflow cycle because both sides will reflow at the same time. With this modified process, a run of 10,000 boards now only takes 14 hours – that's an extra 8 hours saved and a throughput increase of about 57%!

There are several aspects of the fixture design that enabled the increase in throughput:

- Integrated reflow windows serve several purposes. First, they provide an area for the un-reflowed solder to sit undisturbed after the first print. Second, they provide a direct area for hot-air convection to access the un-reflowed paste. Third, they slightly reduce the overall thermal mass of the fixture for better heating dynamics.
- The fixture features locating pins for positional accuracy. This ensures that each PCB sits in an accurate, repeatable location so that the machine will be able to accurately place all of the DFN components – poor placement accuracy was one of the biggest problems with the previous manufacturer.
- Milled pockets on both sides of each PCB provide an easy way for the SMT operators to remove and flip the PCBs between stencil printing operations.
- The fixture is constructed using a high-temp composite designed to provide consistent heating dynamics as well as survive multiple reflow cycles that reach temperatures of >260C.