

Fixturing in Selective Soldering: When is it Needed?

By Alan Cable, President, ACE Production Technologies Inc.



Fixtures are typically needed for non-traditional PCB assemblies. The vast majority of boards that are selectively soldered go into the machine without any fixturing. Odd-form parts, and particularly flex circuits, need fixturing occasionally. For example, some flex circuits must be held down flat; one has to 'locate' the flex

circuit and then hold the components in place for the soldering operation.

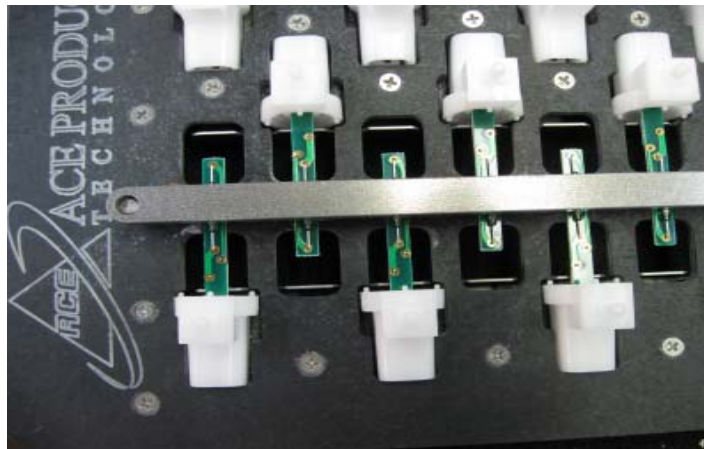
Other typical reasons for using fixturing include instances where the board edge clearance is not to SMEMA standards; or if there are components that hang over the edge of the board, as in edge connectors. Another reason might be if a panel of boards is of a particularly thin PCB material, or double scored, or heavy towards the center, the board may need fixturing to hold it flat, so that the small solder wave does not contact the bellying of that board.

The process of providing fixturing, as relatively straightforward as it may seem, is not nearly the same as providing an accessory or a spare part to accompany a machine, however. Rather, it is part of a total package, because engineering and process development are part of the overall effort. Because we're primarily an engineering-oriented company with an emphasis on machine and tooling design, this role is well suited for us; but any supplier of production soldering equipment should recognize that their role is or should be more than just shipping a machine.

Instead, the goal should be to provide a complete package, including process development and fixture design, when fixtures are needed, to make the whole process work seamlessly. The ultimate goal in selective soldering is to help the customer meet and exceed his throughput and quality goals through this unique soldering process.

Who provides the fixtures? In our case, we provided the design of the fixture, and we do all of the design in 3D modeling, seeing how it will work and how it fits on the machine that we're supplying. We also develop the process, in conjunction with the customer's process engineering people, and design the nozzles, so that the customer gets a complete turnkey system ready to go to production and individualized to that customer's process and product manufacturing requirement.

For the 3D modeling, we use SolidWorks, and also for nozzle design. Since we're using one program for both, we can easily articulate both nozzle and fixture together. (SolidWorks is a 3D mechanical CAD (computer-aided design) program that runs on Microsoft Windows and was developed by Dassault Systèmes SolidWorks Corp., a subsidiary of Dassault Systèmes, S. A. (Vélizy, France). SolidWorks is currently used by over 1.3 million engineers and designers at more than 130,000 companies worldwide).



Fixturing is occasionally needed in selective soldering.

Fixtures, or pallets, are generally machined out of a high-temperature composite material that is also impervious to attack by flux chemistries. It is very dimensionally stable when subjected to temperature changes and does not conduct heat very well, a significant advantage. The primary disadvantage of the material, known as

Durostone®, is that it is very abrasive and hard, and therefore difficult to machine.

How many fixtures does one need for an applications? A manually-load machine needs a minimum of three; one is being processed while two are being loaded and unloaded. Automated lines may have a dozen or more. Designing a fixture for a particular application generally takes less than a week.

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Fixture design and manufacturing requires a real skill set that develops over time and experience. Successful fixture design requires an intuitive understanding about how to build a fixture correctly, in terms of holding, locating, making it effective for soldering, taking into account the flow dynamics of the solder, nozzle shape and effect, and all important considerations.

Nevertheless, today's equipment supplier needs to be more of a solutions provider, working in close partnership with the customer in order to provide a complete turnkey system that's individualized and engineered to the customer's specific application and manufacturing requirements. It's not enough to simply ship a machine to a customer and expect them to fit it into their manufacturing environment. The future of success for equipment providers is to become total solution providers.



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