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De-fluxing Eases 'Sticky Situations'

Using a contract assembler offers several benefits. However, when outsourcing a no-clean process, the challenge for contract assemblers lies with the multiple applications, processes, materials and expatiations that customers set.

by Mike Konrad, Aqueous Technologies

There are several advantages to using a contract assembler. One of which is maintaining the ability to dictate desired results. Therefore, how those results are achieved becomes someone else's concern. When you combine this with the fact that many contract assemblers are not accustomed to saying "no," you become a witness to the birth of innovation.

No-clean technology has gained acceptance in many applications; however, it remains taboo in others. Ironically, the same OEMs that institute no-clean processes "in-house" prohibit them in "outsourced" products or services. The challenge of implementing an effective de-fluxing program, in many instances, is directed to the contract assembler. Because OEMs can standardize a process over a range of products, they can maintain an inherent advantage over contract assemblers. Fortunately, there are no shortages of cleanliness specifications, or means of measuring cleanliness. The challenge for contract assemblers lies with the multiple applications, processes, materials and, in some cases, expatiations that their customers set.

Frequently, customers predetermine much of the pre-clean process - flux, paste/alloys selection and board design. These pre-clean processes are factors in the downstream cleaning/de-fluxing process. It is not uncommon for an OEM to require the use of a no-clean solder paste, or require its complete removal. The white residue and moderate ionic contamination levels frequently associated with a no-clean process seldom are tolerated, and normally are requested by an OEM upon incoming inspection. With process optimization, no-clean results are considered "acceptable" in many applications. However, this optimization process is difficult for contract assemblers because they are running multiple production lines; using multiple processes for multiple customers.

Because a contract assembler operates various production lines and associated processes and profiles, it is unreasonable to expect the processes and profiles to align themselves with the requirements of a de-fluxing system. It is more reasonable to use a de-fluxing system that can adapt to multiple applications and related processes.

De-fluxing Methods

There are two basic de-fluxing methods available to contract assemblers - manual and automatic. A manual process may consist of saturating a post-reflow board in an IPA or alternative solvent media either by soaking it in a pan or applying it using a can of pressurized de-fluxing chemical. A technician must scrub the board in hopes of making the flux residues more soluble. Boards then are manually rinsed and placed into an oven for drying. This manual cleaning process is non-consistent, labor-intensive and lacking in both immediate process control and statistical process control (SPC).

There are two automatic de-fluxing choices that offer a degree of conventional wisdom and performance. These two automatic de-fluxing alternatives are in-line (conveyorized) de-fluxing systems (Figure 1) and batch-format defluxing systems (Figure 2). In-line format de-fluxing systems have been popular choices because they offer good cleaning results and high-throughput capabilities. However, in-line technology often is viewed as too large, too expensive and too inflexible. Recently, contract assemblers that process a high variety of board designs, sizes and profiles have strayed from in-line technology in favor of batch-format de-fluxers.

Batch-format de-fluxing systems give contract assemblers and OEMs a high level of process flexibility. Proper defluxing utilizes a four-step process:

- Wash
- Rinse
- Dry
- Cleanliness Testing

The wash process uses a specialized wash solution that is compatible with the board's flux residue, and directs it

onto the board's surface and beneath its components. While some boards are reflowed using "normal" oven profiles, others may have been subjected to "aggressive" profiles. This equates to longer wash times on some boards and shorter wash times on others.

A batch-format de-fluxing system can accommodate different wash times and temperatures for each specific load of boards (Figure 3). Rather than adjusting conveyor speed, which also affects rinse and dry times, batch technology allows independent wash, rinse and dry parameters. Unlike in-line technology, one parameter has no effect on the other, allowing for greater process control and flexibility.

Similar to the wash cycle, batch technology allows independent control over the time and quantity of each rinse. A small load of boards may require fewer rinse cycles than a large load of boards. An automatic rinse-water resistivity (cleanliness) sensor monitors the cleanliness of each rinse cycle, allowing rinse processes to terminate when boards are clean, further optimizing the cleaning process.

Historically, batch de-fluxing technology has not been synonymous with effective drying. Recent improvements in batch drying technology have rivaled the effectiveness of in-line drying technology. Batch-format de-fluxing technology offers a point-of-use cleaning method. Unlike in-line cleaning systems, whereby numerous production lines are funneled into one cleaning system, batch-format cleaners physically are small enough to be placed where needed. Lower acquisition costs and operating expenses associated with batch-format technology allows for the possibility of multiple machine installations when required at a cost normally less than a single comparable in-line cleaning system.

Perhaps the greatest attribute of batch-format de-fluxing technology is its ability to monitor, control and record cleanliness results. As OEMs have their own cleanliness expectations, batch-format de-fluxers can meet each customer's cleanliness criteria. Moreover, batch technology allows OEMs to use captured cleanliness data for inspection. Valid SPC is vital for ISO, TQM and other quality standards and practices.

Conclusion

The contract assembly industry is highly competitive. It is expected to keep up with customer needs, as well as the demands and restrictions of evolving technologies. Contract assemblers often are subjected to quality standards exceeding those of many OEMs. Fortunately, cleanliness-related demands can be met more easily. This is due to the evolution of batch-format de-fluxing technology.

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Published in SMT Magazine