Greater Flexibility in the Selective Soldering Process Without Reducing Throughput

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Original equipment manufacturers (OEMs) and electronic manufacturing services (EMS) companies must adapt automated selective soldering processes to improve the consistency and quality of their products. The competitive marketplace is a driver for automated selective soldering because it results in faster process times, reduced rework, easy board handling as well as other important factors.

Process Considerations

Various factors need to be considered when implementing a selective soldering process including the type of operation, production volumes, automation requirements, takt time and ancillary process equipment. The type of operation determines if the required production can be achieved in a normal eight-hour shift, five-day work week or if pays to invest in equipment with a higher production rate.

Takt time, or cycle rate, refers to the amount of time it takes to load boards, execute a selective soldering operation, including fluxing, preheating and soldering, as well as unloading the boards from the selective soldering machine. Takt time is used as a measure of production capability and to determine bottlenecks within an operation as well as to determine the number of machines required to fulfill a predetermined production rate.

The ancillary equipment depends upon the process demands for a product and is based on what the cycle rate is and how the process is setup. Examples of ancillary equipment include material handling consisting of in-line conveyors, board inverters, board stackers or product accumulators. These are typical of in-line systems and are necessary to maintain the process and minimize operator intervention.

For certain low-volume selective soldering applications, some end-users sometimes opt to use manual soldering rather than selective soldering. While useful for small series production, manual soldering is no longer used in mass production because of quality assurance concerns and is no longer allowed in the automotive industry and other high-reliability applications. Increasing complexity and ever higher quality standards have contributed to soldering by hand no longer being accepted as an adequate technique.

While useful for some one-off applications, or for repairing of individual solder joints, manual soldering has several disadvantages since reproducibility is operator dependent which means throughput and quality cannot be guaranteed. Adding to this, extreme flux residues can result from manual soldering as well as higher localized thermal loads due to the small soldering tip and small contact area.

For moderate production volumes, standalone selective soldering systems are often used since they tend to have a small footprint and require relatively low capital expenditure. The disadvantage of standalone systems is the continuous operator intervention required to load and unload boards during the operational cycle.

Versatility vs. Throughput

End-users often must choose whether they want to prioritize versatility or the throughput of their selective soldering operation. With introduction of the Nordson SELECT Cerno® 300S in-line selective soldering platform, this new system maintains the versatility that is necessary for small batch production or cell manufacturing, without diminishing throughput. The Cerno® 300S is also exceptionally compact for an in-line system, requiring less than 1.1 square meters of factory floorspace (Figure 1).
The features of the Cerno® 300S allow users to have the “best of both worlds” and not have to worry about this difficult decision when purchasing a selective soldering system. The Cerno® 300S compact platform includes fluxing, preheating, and soldering functionality. By integrating all three processes into one compact platform, the Cerno® 300S can process printed circuit boards at the same speed as larger or more expensive machines. However, the modularity of the design allows users to quickly adapt the machine when application requirements change. Larger in-line machines that are prioritizing throughput, often do not provide this level of adaptability. The Cerno® 300S offers the throughput of larger machines and the versatility and adaptability of smaller machines. This combination provides great value for users looking for an in-line system with excellent process capabilities and throughput speed.

**Fluxing Control**

As with all Nordson SELECT systems, the Cerno® 300S is equipped with a maintenance-free MicroDrop drop-jet flux dispenser that ensures fluxing of liquid flux precisely to the individual droplet processing both individual points and entire lines for connectors in a single pass (Figure 2).
The volume of flux in every single droplet can be adjusted to the requirements of each soldering point. And because of this selective fluxing of the printed circuit board, contamination is minimized and consumption of flux is drastically reduced. Monitoring of the jet of flux ensures that flux has been applied with the data being read and processed in an available on-board data logging system.

An additional advantage of drop-jet dispensing is that it provides complete control of an adjustable droplet size together with low consumption of the liquid flux being applied. Because no-clean flux residues are completely consumed when using selective soldering, a drop-jet flux applicator is a distinct advantage of selective soldering over wave soldering using aperture wave pallets since no-clean flux residues cannot become entrapped underneath the wave pallets. Another distinct advantage of using a drop-jet flux applicator for selective soldering is that it allows for true no-clean processing and mitigates the need for post-soldering rework and repair.

**Process Repeatability**

Technologies including the MicroDrop drop-jet flux dispenser, combined with optional flux jet monitoring, automatic solder level monitoring, fully automated fiducial alignment and board mapping, automatic laser-based wave height sensing and closed-loop process controls, provides the Cerno® 300S with unparalleled process capability (Figure 3).

![Figure 3: Solder nozzle with automatic laser-based wave height sensing to ensure process repeatability](image)

Adding to its ease of use, the Cerno® 300S is equipped with a full titanium solder pot that is compatible with all solder alloys, quick change magnetically coupled solder nozzles and allows for easy tool-free maintenance. The Cerno® 300S is available with a full surface topside infrared preheater with scalable preheating from 1.5 kW to 4.5 kW to match a broad range of preheat requirements. Despite its compact footprint, the Cerno® 300S can handle printed circuit board assemblies up to 500 x 300 mm (19.6 x 11.8 inches) on its in-line SMEMA chain conveyor which is equipped with an automatic conveyor adjustment.

**Conclusion**

Selective soldering is a well-know and highly defined process performed on electronic assemblies to form solder interconnections in a highly efficient manner. The increased capability of Cerno® 300S provides a cost-effective alternative to other selective soldering systems and can process printed circuit boards at the same speed as larger or more expensive machines.

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