

3D Inline Solder Paste Inspection - Benefit Realized

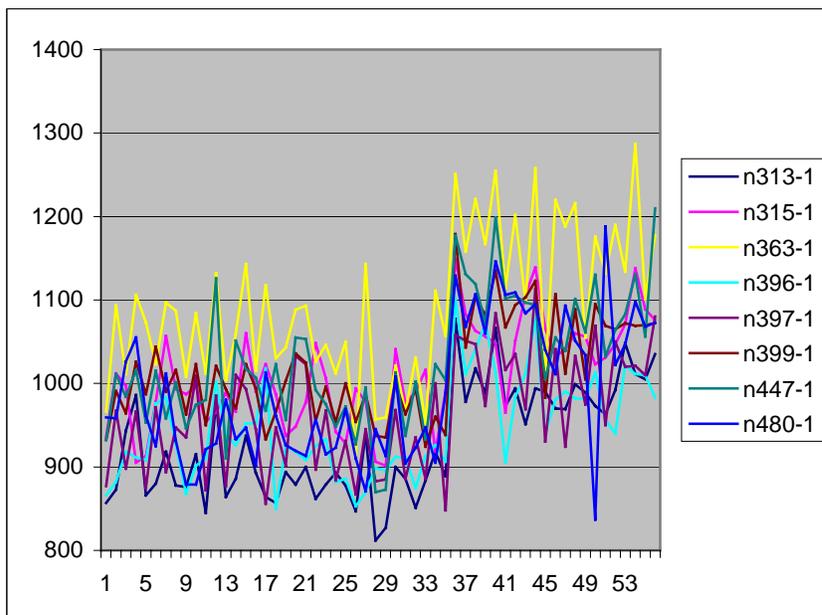
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It is an established fact that many defects are attributed to the solder paste printing process [1,2,3,4,5,6,7]. Some publications and companies claim this number to be as high as 80% of their overall defect pareto! It is also a known fact that solder paste volume is an important predictor of good quality solder joints and long-term reliability of solder joints [2,8,9,10]. Use of 100% solder paste inspection (SPI) helps reduce the contribution from the print process to solder joint defects [11], in-turn saving money by reducing the cost of scrap with minimal cost to rework (i.e. wash boards) and with no penalty in solder joint reliability [2]. Calculations have shown that pre-reflow print failure can cost 10X less than the post reflow, 70X less than in-circuit test, 700X less than a field failure [1, 2]. With new technologies in solder paste inspection available, process control in conjunction with solder paste printing and 3D pre-reflow paste inspection is imperative. Inline process control is an opportunity to increase reliability and save money.

Countless publications and examples of the information illustrated in the opening paragraph of this article are available showing the various benefits of doing 2D and/or 3D solder paste inspection to control print processes and eliminate or identify paste printing errors. Most companies and people agree that an inspection plan of some sort is a must in today's manufacturing arena with challenging chip scale packages (CSP's) and devices down to 0201's. Why then are many companies utilizing no solder paste inspection, 2D paste inspection or 2D with 3D sampling for solder paste measurements? There are many reasons for this, including the unfortunate economic climate where replacing or adding capital equipment is not favorable. Despite these reasons, new technological advancements in the past few years have made 3D SPI at line rates a reality and several companies have made the investment in 3D SPI. Those companies are finding benefit and are saving more money than they spent on the inspection equipment.

Knowing that process control has become a key element in the success of finer pitch devices, like 0201's, CSP's, BGA's (ball grid array), CCGA's (ceramic column grid array) which have known requirements for volume [12,13]. The ability to tightly control each assembly process to ensure high yields has given assembly houses a definite advantage in the market place. Recent work done by SP50 solder paste inspection customers has shown this benefit. The Agilent SP50 is a 100% inline 2D and 3D SPI system. This system combines the best case resolution with high speed at all times, thus giving users 2D and 3D paste information without a compromise in resolution or speed.

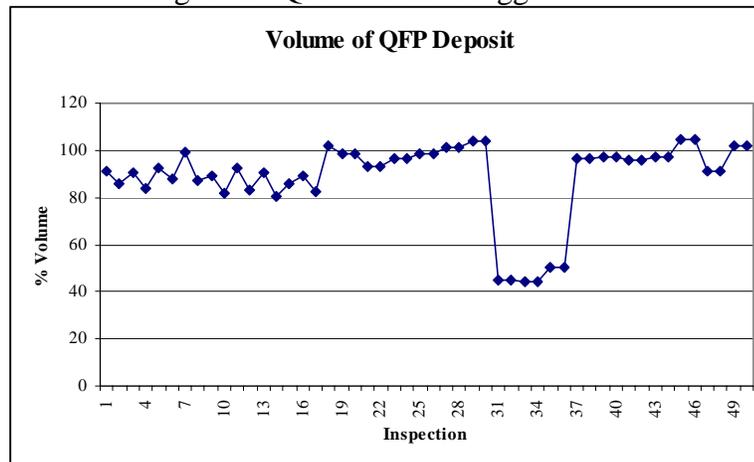
Figure 1- BGA Quality Issue



In one assembly house, a product quality issue with BGA's was identified with the Agilent 5DX x-ray inspection system. The BGA results were analyzed. When the results were studied, volume of the paste that was printed on these BGA's was discovered to be higher at the same time on the day where the quality issues surfaced (Figure 1). Therefore, a fine tune of the SP50 program to catch this volume increase can catch these defects upstream and prevent them.

A second assembly house found that a change in volume had occurred on a QFP (quad flat pack) according to SP50 SPI inspection results (Figure 2). The deposit has a 50% volume reduction for 6 consecutive PCB's (printed circuit board). The SP50 3D solder paste inspection identified the problem. Screen printing adjustments were made and the process came back in control. It is noteworthy that had 2D inspection been utilized this issue would not have been realized.

Figure 2: QFP Volume Flagged



This short article shows two examples, from different assembly houses, on the value add that 3D SPI has given them. In general inspecting 2D and 3D is essential to avoid sending poorly printed devices downstream or compromising the long-term reliability of devices being built (Figure 3). The SP50 3D SPI offering allows our customers to cut costs through process improvement and defect detection and elimination, thus building profits and providing competitive and robust assembly processes.

Figure 3: A few examples of defects only detectable with 3D SPI.



References

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