



How new technology has increased AOI's value to SME CEMs

A Nordson YESTECH Case Study



Nordson YESTECH BX Benchtop Inspection System installed at Wildtrax, Worthing, UK

Nordson YESTECH Case Study

Benefits of AOI

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Worthing based Wildtrax Electronics offers a flexible CEM service to its customers, with an ability to rapidly produce small production runs of sometimes highly specialized PCBs. During over fifteen years' operation, they have witnessed a steady evolution in board complexity and, thankfully, a corresponding evolution in Automated Optical Inspection (AOI) technology. This article looks at why upgrading to the latest available AOI technology is paying dividends for Wildtrax.

As a CEM, Wildtrax enjoys the distinction of NASA accreditation. As part of their service to NASA, Wildtrax had to produce and inspect a run of just four or five high-value PCBs containing gold impregnated ceramic devices. Clearly, any AOI system used for such small and specialized production runs must offer fast setup as well as great flexibility to operate efficiently. But what other features does a company like Wildtrax look for in an AOI system?

Fifteen years ago, Wildtrax started life by building electronics associated with hydraulic power packs for patient bath and bed lift and tilt controls, rail application electronics and battery packs, as well as cable assemblies and data leads. Circuits were typically rugged and often epoxy encapsulated. Their first inspections were performed entirely manually by an operator – one of their first employees.

Their first foray into inspection technology involved using a comparator, which was very slow as well as being inaccurate. Meanwhile, their growing customer base called for a higher throughput as well as larger production runs, with batches of up to 2000 units a month – yet the demand for prototype and low volume runs remained consistent as well. For Wildtrax, this created a need for a faster and more flexible AOI solution.

Accordingly, around 7 or 8 years ago Wildtrax upgraded to their first true AOI system, which used the camera, lighting, motor drive and computing hardware of the day. The unit was the size of a small car and could only be repositioned by dismantling, or by using a forklift truck. However it allowed inspection on a production basis, and continued in use until disaster struck around 18 months ago. The machine was brought to a halt by a hard disk crash – and stayed halted for a while, because no replacement was readily available. The UK distributor no longer supported the equipment and new PC hard drives weren't compatible. Fortunately, a used machine was found on eBay, purchased and cannibalized to allow automated inspection to resume.

However the incident had served as a wakeup call, partly because it highlighted Wildtrax' vulnerability to obsolete equipment, but also because the unit's performance was increasingly lagging the needs of the production line for fast, accurate and reliable throughput. Programming setup time was 1½ hours or more, and sometimes up to a day for a larger board. Drive belt slip introduced a board positioning error of a couple of mm – enough to cause errors in the machine's fault reporting. Problems were also being caused by excessively reflective PCB material, as well as reflections from components with glass tubes. Inspection was not made easier by the monochrome images, poor resolution and insufficient contrast.

Above all, the system's scanning technology made the throughput too slow for many boards, with too many false positives and missed faults.

Accordingly, AOI vendors were invited in to Wildtrax to demonstrate their latest available technology. One machine had to be removed from site after 8 hours' effort from the supplier failed to persuade the demonstration to run. By contrast, the Nordson YESTECH BX system was up, running, programmed and inspecting a simple sample board supplied by Wildtrax within half an hour of arrival. And, as a reflection of modern technology in cameras, lighting, drives and computing, the unit had been transported in the back of a car and easily carried to a benchtop allocated for the demonstration. In many small CEMs, space is at a premium, and the BX's benchtop-scale dimensions alone are an important feature.



Nordson YESTECH BX vs earlier AOI technology – a remarkable reduction in size

The BX pricing was attractive as well, so Wildtrax proceeded with purchasing and familiarizing themselves with the new machine – a process they found simple after training from YESTech-Europe. The BX kept its promise of fast programming made during the initial demonstration, and its fast throughput was demonstrated by the disappearance of the production board backlog that had been attendant on the earlier machine. “We like the way the BX does what it says it will, and appreciate its simplicity of use” commented Ian Warren of Wildtrax, “Additionally, since installation, we’ve been discovering the other ways it can boost our productivity. For example, sometimes our customers have issued us with low cost PCBs where fiducial mark positioning varies across different batches. The BX can store different versions of the board image to match each different fiducial position, then, during inspection, automatically check the board against all stored image versions as necessary. This automates a process where we previously had to keep re-adjusting and running the test again until the false positives were eliminated”.

This flexible automation is equally useful for handling further inconsistency problems that arise because a CEM doesn't have control over the sourcing or quality of the boards he is asked to build or manufacture. Boards can be distorted, pads can be oversized or undersized, and components can float from their base positions. This is in addition to problems that inevitably confront every manufacturer, such as soldering quality, component tombstoning and billboarding, wrong components or wrong orientation, or inconsistencies in component labelling between batches.

In transferring to the BX AOI, Wildtrax naturally wanted to make use of data for component types, orientation and positioning they already hold for all the boards they regularly manufacture and inspect. They are achieving this without undue delay to their production by importing CAD files, singly as they are needed, from their pick and place machines. These files can be readied for the BX by using Nordson YESTECH's universal CAD Translator software and a little editing to remove information not needed by the BX. Alternatively, when Wildtrax needs to inspect brand new boards for which no data is held, the new inspection program can be set up on the BX in typically ½ to ¾ of an hour. After inspection data has been entered by either method, the BX can be toggled between boards in seconds – a very useful attribute considering Wildtrax's need for flexibility in inspecting diverse, low volume production runs.

Now that Wildtrax has been running the BX for around 3 months, the advantages for production inspection as well as setup are making themselves apparent. Wildtrax particularly likes the BX's sharper definition, colour lighting and filtration, which copes well with poor ident markings due to bad printing or bad laser etching. The color filters allow image enhancement to reduce the incidence of false positives. Similarly, where specific solders are used on some production runs, the refraction characteristic can be optimized by the use of color filters and contrast. The side view cameras give extra readability from their different position, as well as checking if components are down on their pads.

The BX has also introduced automation to board panelisation. In a typical example, Wildtrax produces panels containing 8 identical boards with PIC microprocessors. On the old AOI, the whole panel had to be programmed as if it contained one large board, whereas on the BX, only the first board need be set up by programming, then the other 7 can be set up using step & repeat. Then, during production, the BX can be instructed to ignore any board within the panel deemed as a 'cross off' for any reason. This is a considerable time saver compared with the earlier AOI's need to delete every component within a cross-off – then program it back in for fully populated panels.

“Given the nature of the products we manufacture, QA is critical, so we perform 100% inspection. This includes 100% re-inspection of any boards we find necessary to rework. The BX's speed of setup, smart features and production throughput is contributing significantly to our achievement of this, and therefore our business efficiency.” Ian Warren commented, “And our access to this new level of AOI technology was facilitated by first class service, fast response and an effective training course from YESTech-Europe.”