Unlocking your Nordson YESTECH AOI and AXI system's true potential

Whereas an AOI system allows operators to isolate faulty PCBs as they leave the production line, Cupio's VuData statistical process analyser software acts on AOI-generated databases to provide a bigger picture – giving operators and line management visibility of a process's underlying trends and an opportunity to make corrections and improvements. In this article, Ben Seviour, Software Support at Cupio, explains how the software works.

Today, most PCB assembly lines would be difficult or impossible to operate without an automated optical inspection (AOI) system of some type. Boards are typically too large, and too densely-populated with tiny components to allow efficient manual inspection; in other circumstances, the boards may be simpler, but manual inspection would simply take too long. An AOI system operates far more efficiently, reliably and quickly than any human inspector could – and it gathers large amounts of potentially useful data as it does so.

Some of this data is acted on immediately. If a PCB component is wrong, missing, badly positioned or poorly soldered, AOI will reveal this, allowing the operator to capture the faulty board before it can move on to become an expensive field failure. However the AOI system alone will not present the operator or line manager with information to indicate more strategic actions leading, for example, to longer-term yield improvement – even though the underlying data is being steadily collected into the AOI system's database.

Some plant operators consider that such analysis and reporting would not be beneficial in their circumstances, while others extract the AOI data into a larger manufacturing operations software environment, which then generates user-friendly statistical displays and reports.

Visibility of process trends

Cupio's VuData statistical process analyser software package offers an alternative approach, which is cost-effective and easy to implement. Using data from any Nordson Yestech AOI system's database, VuData generates detailed reports and live charts that expose trends within the production process. These can reveal if a reflow solder oven's temperature profile needs adjusting, or that an operator would benefit from further training, to give just two examples.

Whereas the AOI user interface is focused on issues related to the board currently under inspection, VuData shows bar charts, pie charts and reports for a volume of boards over a period of time – a bar chart is a snapshot of production for the last hour, 15 minutes or other time frame as selected by the operator. The snapshot can be a live, rolling record of production just completed, or it could be a historical record recalled for management review or customer discussion. The bars can show faults per board or by component reference ID. The operator can focus on the fault levels that really matter by setting a couple of thresholds. Failure rates below the lower threshold will not be displayed at all, while those below the second threshold will be displayed in blue. Attention is focused on rates above this – i.e. those that merit closer review and action – which are displayed in red; see Fig.1.

However what constitutes a defect? Within AOI systems a component state may be regarded as defective not for an absolute reason, but because the operator has classified it as defective. For instance a variation in component marking may indicate a missing or wrong component, or it may simply be due to the component manufacturer changing the font or size of their printed label characters. Either way, the operator uses his production environment knowledge to make a defect classification decision; efficiently capturing genuine defects while tuning out false positives. These defect classifications can be reviewed in VuData. Additionally, VuData can show false calls per board or by component, and times spent on board review by each reviewer. Other charts showing different metrics can also be added.
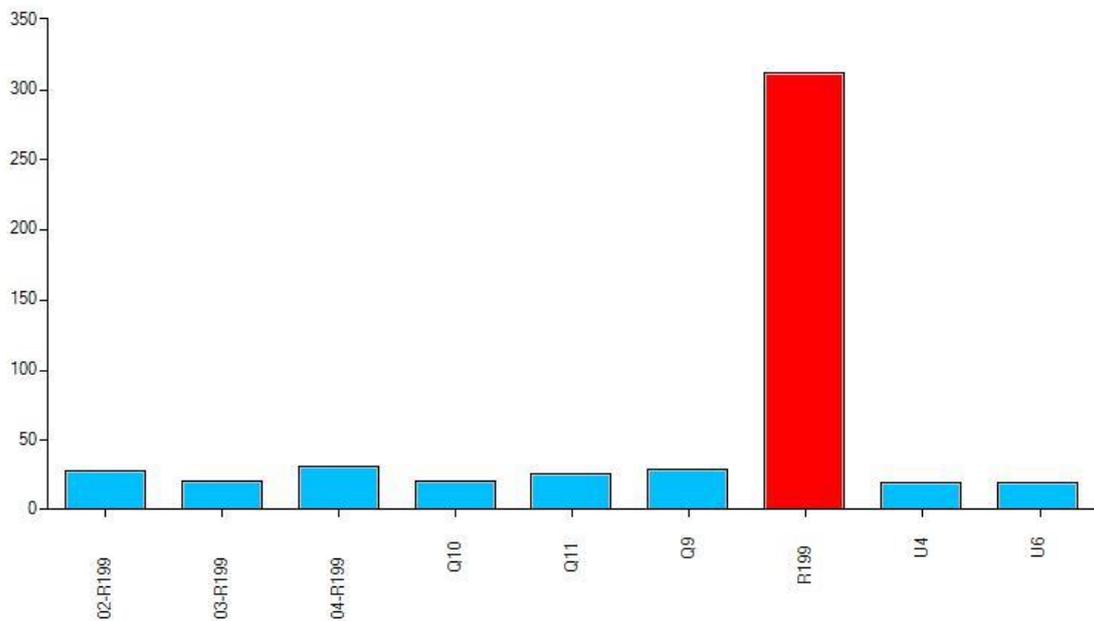

Fig.1: 'Parts failed by RefID' chart, showing non-critical blue bars and critical red bars

Showing data related to volumes of boards reveals underlying trends and, critically, indicates causes of failure as well as just the failures themselves. For example a recurrence of a wrong component type in a given position would indicate that a wrong component reel has been loaded into a pick and place machine within the assembly line. Similarly, recurring poor solder joints could indicate a wrong temperature setting on a solder oven. If problems like these are spotted on a live production line, action must clearly be taken as soon as possible to stop continued manufacturing of faulty boards. Accordingly, VuData can be configured to automatically email warning messages to relevant staff, alerting them to take action as required.

Variable depths of reporting detail

VuData can also generate more detailed reports as appropriate. For example a report can be configured and raised for a single board, showing a bar chart of all possible defect types; Marking, Lead and Solder. Reports have navigational functionality, allowing users to drill down to the details that interest them. Details for each defect include its reference ID and the affected part number. An image of the defect can also be retrieved for examination. Statistical information including yields and total opportunities for failure is available for further analysis. Similarly, reports can be generated for complete works orders or assemblies. They can be customised for specific inspectors and reviewers, and filtered by start and end dates.

Once generated, reports can be exported as Excel files, PDFs, JPGs and in other formats. This, together with the ability to report on historical as well as live information, renders them as a valuable resource for customers as well as the manufacturer's management and operations staff. Evidence of board production and quality statistics can be regularly supplied as part of the production delivery documentation, while special reports can be raised as proof of manufacturing quality in the event of any product returns from customers – even if these arrive months after original production and shipping.

Fig.2: Example of a single board report

Even more granularity is available for applications that require it, because as well as its report generation and navigation functions, VuData gives users direct access to the raw data held in the AOI system's database, without need for MS database access. Data can be ordered, grouped and sorted, and suitable parameters selected for export and external use.

While increased levels of detail and information provide greater levels of insight into the production process and its trends, in-depth reviews can be time consuming and not always necessary. VuData's flexibility allows for this, as the level of reporting detail can be varied as appropriate for individual lines, machines, dates, operators and other entities within the overall manufacturing process.

Conclusion

Overall, VuData is a cost-effective, easy to set up and use complement to the AOI inspection process. The AOI system captures and records the fundamental marking, lead and solder defect information, and allows an operator to intervene immediately the production line presents a faulty board. VuData, however, reveals the bigger picture; it provides manufacturing operators and line management with the opportunity to expose underlying process trends and act accordingly to make both short term and longer term improvements to production yields. It also allows manufacturers to take better control of their customer relationships by providing quality evidence for both regular production and warranty returns issues. And its flexibility means that users can focus entirely on areas of importance, profiling their analytics effort closely to the needs of their particular process.