

# Inspection Data Remains the Currency of The Smart Factory

By Juan Arango, Managing Director, Koh Young America



*Any successful deployment of a smart factory or Industry 4.0 strategy must start with the ability to interrogate processes automatically and in real time. Yes, connectivity is the foundation of the smart factory, but without realtime data that connectivity is worthless.*

According to a recent case study with one of Koh Young's customers, Matric Group, there's no such thing as too much inspection. Their view is simple, you can't have too much quality, too much efficiency, too high a first pass yield or too few escapes. Therefore it follows you can't have too much inspection, particularly when it's the right inspection.

#### **The Factory Intelligence Value Chain**

There is a simple value chain that is essential to smart factory success. It starts with wholesale connectivity of every machine and process on the shop floor and it ends with actionable intelligent data. In between, there are several key steps and factors that will ensure success. Whether you look at it from the bottom up or the top down, in essence "connected machines need to communicate reliable data that can be converted to intelligence which can be used to make decisions that improve performance, all in real time."

As the industry leader in True3D™ measurement-based inspection solutions with a focus on SPI (solder paste inspection) and AOI (automatic optical inspection) in an SMT (surface mount technology) environment, we are acutely aware of what is needed to move along that value chain from connected machines, through reliable inspection data, to manageable and actionable intelligence.

“**Connected machines need to communicate reliable data that can be converted to intelligence and used to make decisions which improve performance – all in real time.**”

It all starts with exceptional data, and in terms of inspection, that exceptional data is all about the measurement provided. This should never be underestimated. Any suggestion that any data will do, or that any data is better than no data, is fatally flawed. These mindsets are inconsistent with what the smart factory is all about. Decisions made using bad data are bad decisions, pure and simple!

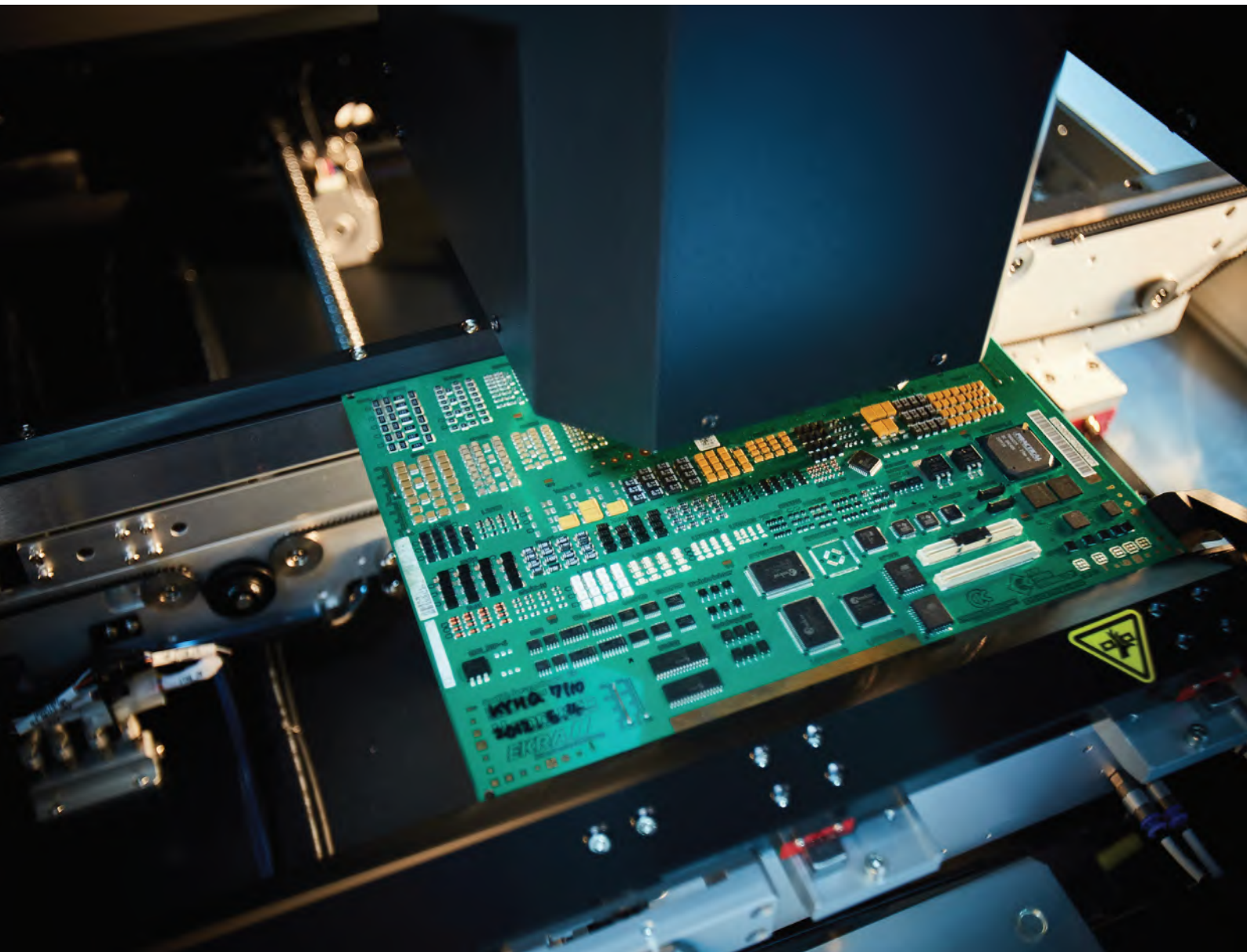
The manufacturing process, as it relates to PCBA (printed circuit board assembly), is easy to define and the opportunities to collect data are also relatively straightforward.

- It all starts with a PCB (printed circuit board) entering the solder paste printer. This PCB should already have some inspection and test data associated with it, some optical and some electrical.
- Once solder is printed on the PCB, it's inspected using an SPI (solder paste inspection) machine.
- This is where we can start using the data received to make intelligent instantaneous decisions to improve the performance of the solder paste printer, using real-time feedback from the SPI system.
- Next up is the placement machine, and again here an inspection process is occurring as the placement head captures images of the

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components placed, as well as storing and collecting data on the component reels on the machine.

- Again, there is additional data with each batch of components or even each component that provides insight into that component. This is yet another key part of the digital thread and the package of intelligent data available. These



components might have been through a reel-to-reel inspection process or an x-ray inspection process to ensure they are fit for purpose.

- After placement some manufacturers, like Matric, are now using pre-reflow AOI to provide an additional snapshot of the PCBA before reflow. This data can also be used to make real-time adjustments to the mounter, which can ensure quality and performance are continuously improved.
- Again, this data has immediate value, stopping any misaligned devices being soldered to the PCB, which causes additional and more invasive rework.
- The PCB is then reflowed, and here thermal data from profilers, oven sensors, and thermal image cameras is collected before the board exits the reflow oven.
- At this point, the PCB goes through a post-reflow AOI to inspect the assembled board, looking for issues and collecting data related to component placement and solder joints.
- Beyond the end of the SMT line there are other processes and other inspection processes, such as THT (through hole technology) assembly or pin insertion, as well as manual assembly and inspection processes, all contributing to the available data and eventual intelligence associated with the PCBA and final product.

There are numerous processes, and all these plus the associated inspection processes, provide critical data that can have an immediate impact as well as a value to the inspection data ecosystem.

#### The Four Roles of Inspection Data

1. The data from inspection can be used locally and immediately, such as in the case of an SPI system supporting better adjustment of a solder paste printer, or a pre-reflow AOI providing feedback to the placement machine to improve yield.

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2. Inspection also acts as a gatekeeper by ensuring any faulty PCBs do not continue down the line wasting money, or worse, escape from the factory into the market with an inherent fault.
3. Individual inspection, as well as holistic data, can be used to isolate root causes of manufacturing issues and improve manufacturing performance such as first pass yield or line efficiency.
4. Inspection data also forms a key part of the granular traceability data needed by many users and industries. This data is invaluable to isolate faulty batches and reduce negative impact of a recall.

For many, the Industry 4.0 journey to a Smart factory is well underway. They have invested in connectivity and are starting to utilize the inspection data they have. Getting even closer to the nirvana of Industry 4.0 will happen when that data is both holistic, connected, and complete. If we can get great data from every process, through inspection and otherwise, we can truly build a smart factory that relies on great data to make great decisions, all in real time.

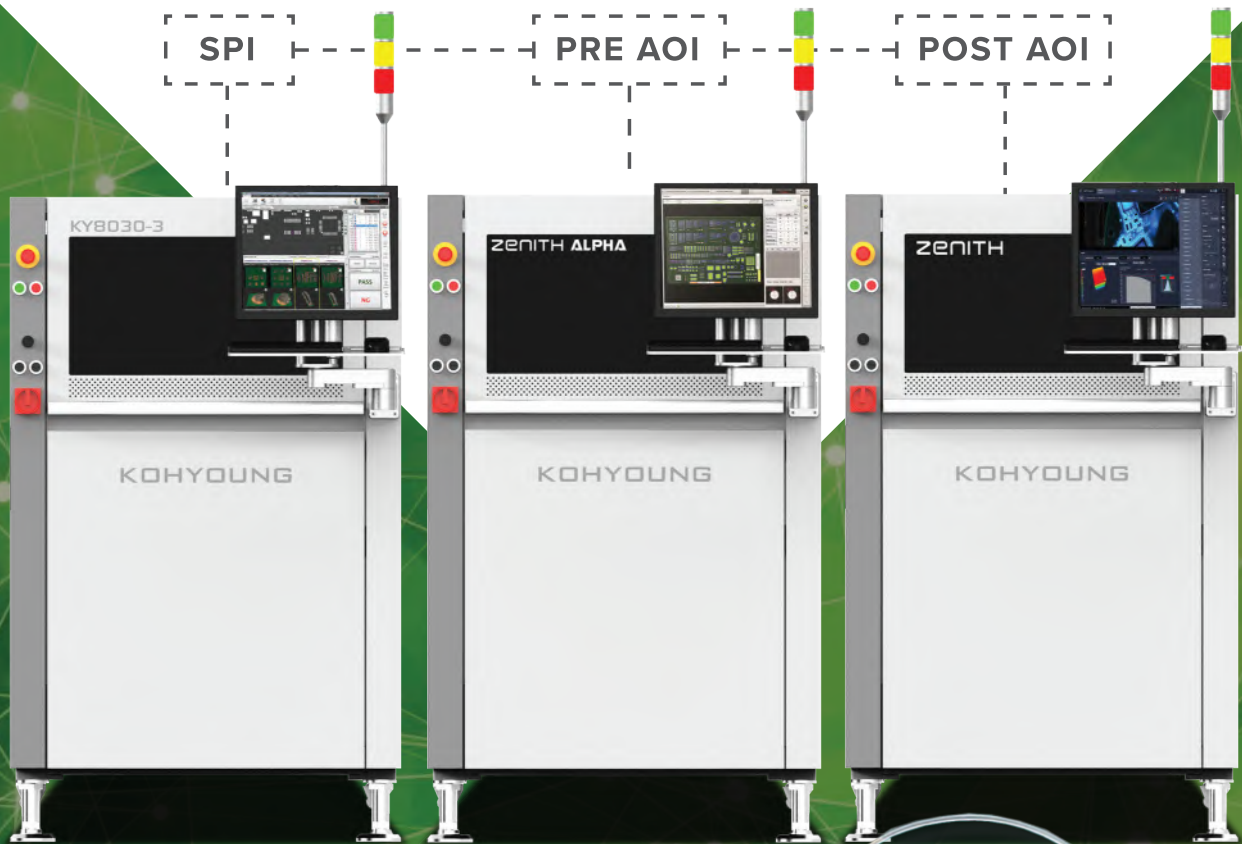
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