

Flipping unnecessary!

Double-sided Inspection of THT and SMD Assemblies



AOI and Barbecue – an Analogy

Who can't imagine – a mild summer evenings with friends and family while enjoying the culinary delights of a barbecue. Great care is taken on grilling each side of a juicy steak, and flipping the meat at the right time is a ritual celebrated just like the later enjoyment of a good wine.

Of somewhat different nature is the production of electronic assemblies. For cost reasons, unnecessary operations should be avoided and, as far as possible, several processes parallelized. This particularly relates to production steps of assembling and soldering both sides of the PCB within a production sequence. Both the placement of THT components with their subsequent wave soldering and the joint mounting of SMD and THT components with their following reflow soldering, based on pin-in-paste technology (also named THR) are prime candidates.

The article describes the opportunities in utilizing AOI systems for double-sided inspection of THT and SMD assemblies in the context of efficient line integration.

THT assemblies – faults occur on both sides

Just like in the SMD production line, faults on THT assemblies may occur within each production step are inevitable. The high number of wired components and the related manual assembling require a consistent quality check – for component faults (wrong polarity,

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missing component, wrong type, wrong component value) as well as solder process faults (non-soldered, insufficient wetting, shorts, solder beads, blow-outs). Possible solder faults are summarized in image 1.

Because of the diversity of these faults' and the associated impact on quality the utilization of AOI systems within the THT production process is mandatory.

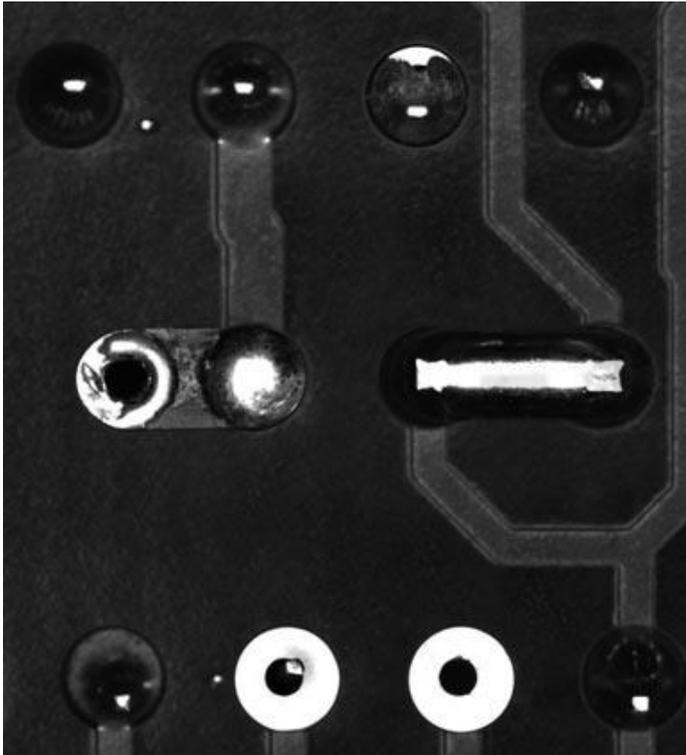


Image 1: possible solder faults on THT assemblies

Because of the listed possible faults on component and solder sides, AOI systems in the THT production process must support double-sided inspection. In addition to a THT component accommodated inspection height of 80 mm on the upper component side, a powerful camera module for solder side inspection is also necessary. Naturally, the inspection of both PCB sides must be run within the line cycle time, i.e. AOI systems should not cause a bottleneck in production flow. Consequently, parallel inspection of components and solder joints is indispensable.

GOPEL electronic's AOI system THT-Line provides these opportunities and features with additional characteristics supporting high efficiency within a production line (image 2):

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- Assembly inspection in carriers
- Handling system based on accumulating conveyor transport with optional carrier return in the lower AOI system area
- Integration of an AOI module for the PCB solder side in the **upper** transport module as well as **lower** carrier return transport
- Parallel and independently working AOI modules for component check and solder joint inspection



Image 2: THT-Line for double-sided inspection of THT assemblies

Due to these characteristics, the THT-Line provides many configuration variants and the opportunity to be installed before the wave solder machine. At this position component inspection before soldering and solder joint inspection on returning assemblies becomes possible. Uniting both inspection opportunities provides “cold” repair of component faults and the saving of an additional AOI system in the production line.

Pin-In-Paste – two technologies in one process

In addition to “pure” THT assemblies, a large part of SMD PCBs cannot do without THT components (image 3).

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Image3: SMD assembly with several THT components

These are mostly connectors but also other electronic components. In order to save a wave soldering step, this technology has been integrated into the SMD or reflow process for quite some time. Thereby, pads for THT components are paste printed the same way as SMD components, and the wired components are also mounted. As a result of solder paste melting, finally an appropriate solder joint evolves during the solder reflow process.

As AOI systems are indispensable for quality assurance of SMD assemblies in the production line, it follows that they should also be used for pin-in-paste solder joint inspection. But the AOI systems then face considerable challenges:

- 1) In addition to the camera module for the PCB top side, an add-on module for pin-in-paste solder joint inspection on the **PCB bottom side** must be integrated into the AOI system.
- 2) For maximum fault detection the camera module for bottom side inspection must feature similar performance parameters in terms of resolution and illumination variants as the top side module.
- 3) Precautions not to influence inspection results by pollution must be made to guarantee trouble-free operation.

The AOI system TurboLine offers not only many configuration variants but double-sided inspection within one system. In addition to various equipment options for PCB top side inspection (up to four angled-view cameras with rotary drive for 360° inspection and microscopic resolutions), a camera module for PCB bottom side inspection can be integrated into the system.

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Image 4: TurboLine for double-sided inspection

In particular for pin-in-paste technology there is the opportunity to assure quality also for such solder joints together with SMD components and solder joints in one process step. The utilization of an additional AOI system or assembly flipping is thereby rendered obsolete.

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