# Facing the Challenges of THT Inspection

The deployment of AOI technology for THT inspection has historically been restricted by a number of factors. These include the physical configuration of most wave and selective soldering lines, which do not lend themselves to conventionally designed AOI machines that are now popular in SMT flow lines. Product is processed in pallets moving on a continuous drive with automatic return on which the inspection must take place.

Although this material handling obstacle has been overcome in different ways, the inspection of THT joints by most AOI methodologies still leaves most manufacturers wary and resistant, while at the same time the high reliability characteristics of many of today's THT inclusive products demand more rigorous production yields because rework is increasingly forbidden.

Long programming times and high false call rates are two fundamental concerns that have traditionally kept THT manufacturers from attempting to implement automatic inspection. By their nature, wave soldered joints include an enormously wide variety of appearances that might seem to preclude rapid programming or deep detection without false calls, and frequent interruption of wave soldering lines is both impractical and unacceptable.

Mek AOI faces the challenges of automated THT inspection with a unique combination of mechanical, optical and software design alternatives different from many conventional systems. In addition to unique, low profile bottom-up mechanics with 9 camera capability, the software and detection strategy employed directly addresses the wide variations in THT joint appearances. Rather than using commercial component libraries as is otherwise common, the SpectorBOX algorithms are histogram based measurements capable of delivering high yield and high detection rates.


Multi-Colour, multi-angle lighting visualizes the solder joint shape in 3D projection. By analyzing the reflections from the various angles, (90° 65° 45°) quality of the solder joint can be determined. The shadow free illumination by the perpendicular lighting system and other omnidirectional lighting systems ensure solder joint quality inspection of any shape and height of any component orientation.

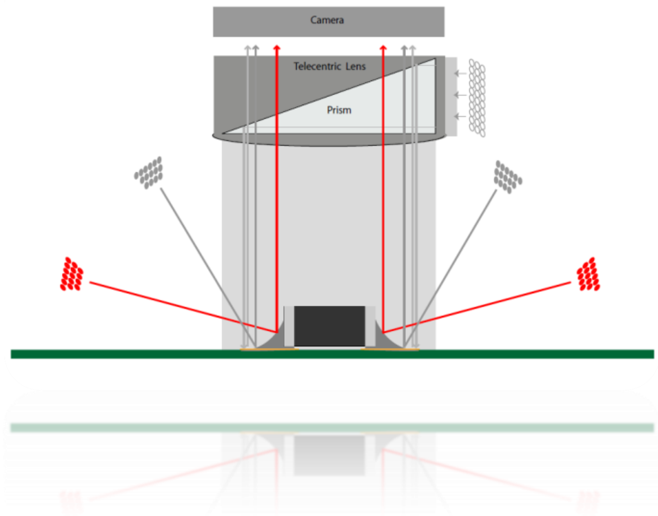
**The range of detectable defects is large, and encompasses many otherwise "subjective" issues:**

- Mounting errors; no pin, no solder, solder without pin.
- Solder deficiency; pin without solder.
- Solder Ball detection.
- Land wetting defect; pin present, solder attached to pad.
- Convex fillet with no discernible lead.
- Meniscus deficiencies.
- Improper wetting leading to poorly shaped connection.
- Circumferential wetting deficiency or excess.

The histogram analysis used to determine defects is a condition based decision, not one based on master images. Tolerances can be set tightly, and there is very low false alarm sensitivity.  A single setting can be used for different pad sizes, multiple strategies can be employed in one spot, and the algorithms can be used in conjunction with other decision methods as well.

**Optics overview:**

- HD CameraLink Camera @ 70FPS
- 18.75/10µ Telecentric Lens with Prism
- Lighting from 3 angles 90, 65, 45




## Practical Examples of THT Solder Defects detected by SpectorBOX:

**Example Problem 1: Mounting problem: No pin available, solder available**

*Figure 1: No pin available, solder available: (Top Camera)*

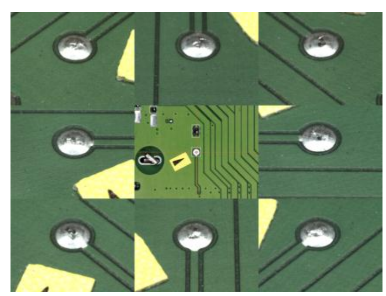


*Figure 2: No pin available, solder available: (Side Cameras)*

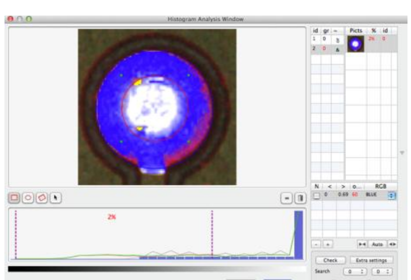


*Figure 3: No pin available, solder available (Histogram – Inner Circle)*

**Example problem 2: Circumferential Wetting Problem**

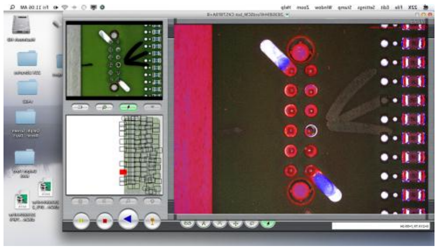


*Figure 4: Circumferential Wetting Problem (Top Camera)*

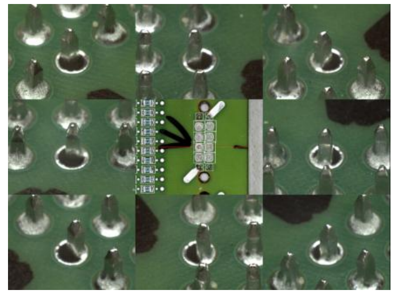


*Figure 5: Circumferential Wetting Problem (Side Cameras)*

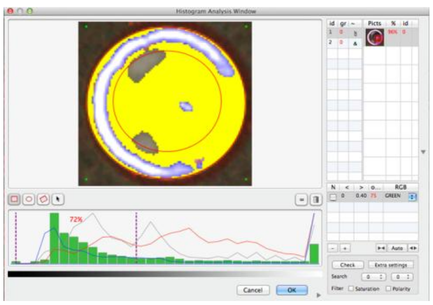


*Figure 6: Circumferential Wetting Problem (Histogram – Outer Ring)*

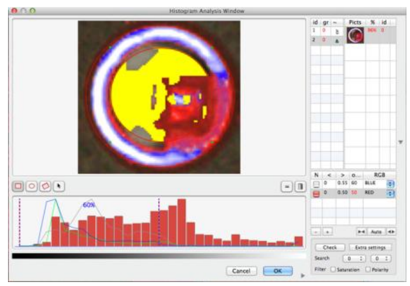


*Figure 7: Circumferential Wetting Problem (Histogram – Inner Circle)*

For more information visit www.mek-europe.com/AOI-bottom-up.php

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-ENDS-

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