

Machine vision, data acquisition converge

By Ann R. Thyrt, Contributing Technical Editor -- Test & Measurement World, 2/1/2009

Electronics manufacturing and assembly processes are governed by strict traceability requirements. In the most concrete sense, machine-vision technologies ensure that those processes work correctly by identifying defects in wafers, components, and PCBs (printed-circuit boards). In a more comprehensive sense, many of these technologies provide the complete traceability that the industry needs.

The tracking, tracing, and control of components and boards are three different functions in the TQM (total quality management) system a manufacturer implements, said Matt Van Bogart, product manager for Microscan's automatic identification products. "A top priority of plant managers is producing high-quality products as efficiently as possible, so you need to quickly identify a problem and quarantine it. To do that, you need a system for tracking the location of components or products at any given time, tracing where they have been previously and what happened to them there, and determining where they will be sent next, which is control. Without tracking and control, you don't have full traceability." [Web exclusive: See **Table 1** for a summary of track, trace, and control applications.]

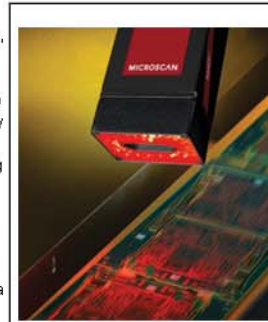
Van Bogart continued, "Item-level tracing can help determine the components and subassemblies of a specific system, and identify where they have been, creating a life-cycle history or lineage of the part. Alternately, tracing can identify problems with a particular machine. You can locate all the parts manufactured on that machine and quarantine them before they get farther down the supply chain." In the control function, auto-ID tasks determine where a part should go next in the process, based on whether it meets the criteria to continue to the next stage.

A manufacturer of data-acquisition and control products for electronics applications, Microscan also sells imaging products for automatic ID, tracking, and tracing. Examples include laser scanners and compact cameras for reading linear and 2-D symbols.

Last fall, Microscan acquired Siemens' machine-vision products, which include smart cameras, imagers, frame grabbers, and software. Siemens had acquired the product line when it purchased the assets of RVSI Acuity CiMatrix in early 2006. Acuity CiMatrix was the developer of the 2-D Data Matrix code. "The former Siemens products now allow us to provide more high-precision control functions traditionally associated with machine vision," said Van Bogart.

Using vision products for ID and inspection is becoming an increasingly important part of data acquisition and control, said Microscan president Jeff Timms. In some cases, high-end, proprietary cameras and software are being supplanted with less-expensive, off-the-shelf technologies.

For example, in a single field of view, Microscan's HawkEye 1600T smart camera reads multiple bar codes and 2-D symbols and also can detect the absence or presence of components, determine whether a part is oriented correctly, and check a component's placement coordinates. "For about \$20,000, you have all of the same functions as the big AOI systems," said Timms. "Many machine-vision or track, trace, and control applications don't require the complexity of big, quarter-million-dollar AOI systems."



A HawkEye smart camera reads 2-D symbols on PCBs. Courtesy of Microscan.

Table 1. Track, trace, and control applications in electronics and semiconductor manufacturing and assembly.

	Track	Trace	Control (imaging/inspection)
Semiconductors (front and back end)	<ul style="list-style-type: none"> • Wafer identification • Glass/solar panel identification • High-value component identification 	<ul style="list-style-type: none"> • Wafer carrier and handling • Flat-panel display or solar-panel glass handling • Component lineage/life cycle 	<ul style="list-style-type: none"> • Wafer growth and sawing • Wafer handling • Wafer positioning for lithography and singulation/die picking stages • Defect and ink-spot detection for die-attach stage • Die attach/bond inspection • Lead-frame inspection • Package inspection

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	Track	Trace	Control (imaging/inspection)
Printed-circuit boards	<ul style="list-style-type: none">• From board fabrication to receiving inspection	<ul style="list-style-type: none">• Parts and packages through surface mount and test• Parts and packages throughout supply chain: board lineage/life cycle	<ul style="list-style-type: none">• Location and guidance for PCB stackup at production cells• Trace verification• Assembly verification
Electronics assembly (multiple subassemblies)	<ul style="list-style-type: none">• Individual part and assembly production	<ul style="list-style-type: none">• Subassemblies through assembly stages• Complete product lineage/life cycle	<ul style="list-style-type: none">• Screen-printer alignment• Solder-paste inspection• Substrate location and part alignment for pick and place• Assembly verification• Test probe guidance

Courtesy of Microscan

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