Delivering a flexible wood-scanning solution

Transverse board scanning

Wood scanning in today's saw and planer mills demands a flexible sensor solution that delivers several technologies to achieve maximum value recovery at high speed, CEO of LMI Technologies Terry Arden told International Forest Industries recently

LMI's new Gocator 200 series offers a modular approach to build a transverse board scanning solution that evolves with the mill to meet changing wood supply and optimization needs," he said.

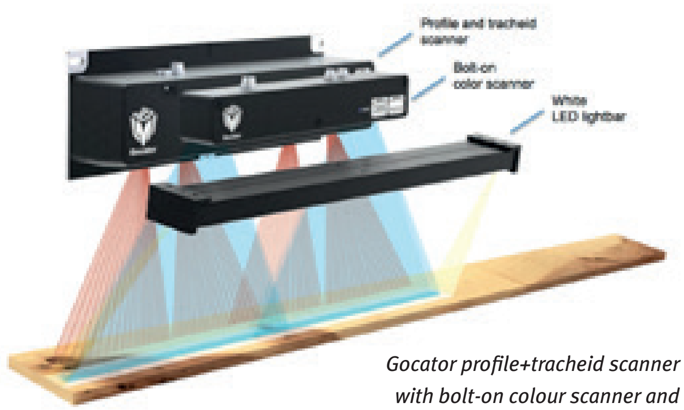
"The Gocator 200 concept builds on the success of the chroma+scan series for board scanning by combining the Gocator smart sensor capabilities with an optimized chroma+scan engine to create greater choices at various price points and deliver a more flexible solution to address a variety of mill scenarios."

Transverse board-scanning layout

Transverse scanning requires multiple 3D scanners positioned along the length of a board to deliver profile data for maximizing volume recovery with optimization software.

In this setup, scanners are arranged in opposing pairs along the board length and generally cover about 2 ft at a time. In a 20 ft scanner frame, for example, there will be 20 sensors with 10 on the top and 10 on the bottom.

Profile data measures the shape of a board as it passes through a scan plane. With opposing scanners (top and bottom), the difference between profile data can be used to accurately measure board thickness. Ideally, the top and bottom scanners should be aligned to the same scan plane for maximum board thickness accuracy. Aligned scan planes minimize errors due to vertical board movement caused by vibration or unstable board transport.



Gocator profile+tracheid scanner with bolt-on colour scanner and one white LED lightbar: Gocator profile+tracheid scanner with bolt-on colour scanner and one white LED lightbar

Multi dot versus line profiling technologies

Scanners generate 3D profile data by projecting a laser pattern onto the board surface and then measuring the position of the reflected pattern using cameras. As the board height varies, the laser pattern shifts in the receiving camera. A factory calibration of the scanner determines how laser patterns on a camera are mapped to physical units in thousands of an inch or millimeters.

The laser and camera are positioned in a scanner head based on laser triangulation geometry, where the camera is tilted on an angle to view the projected laser pattern such that board height changes cause laser patterns to shift in the camera image.

Two types of scanners are common in today's market: multi-dot and line profiler. Aside from the difference in laser pattern (a single laser line versus many laser dots), line profilers triangulate in the direction of board travel whereas multi-dots triangulate along the board length.

"This is an important distinction as multi-dot scanner heads will see the rising and falling edge of the board whereas line profilers may not (unless they use two cameras specifically to cover this case or position the scanner at an angle – say 45° – relative to board travel)," Arden said.

"Multi-dot scanners also use less space on the scanner frame (say 4-6 in) whereas line profilers require more of the conveyor deck (typically 2-3 ft)."

Multi-dots for tracheid

In addition to multi-dot scanners minimizing scanner frame space and seeing both edges of a board, these scanners achieve another critical capability – the measurement of tracheid effect.

When a laser spot is projected onto healthy tracheid wood cells, laser light is scattered into the cells in the direction of cell growth. If the wood fibre is dead (as in a knot), then the laser light does not scatter.

This effect can be measured to identify good wood from defective wood and even determine grain angle.

Adding colour vision

Over the past 10 years, the introduction of colour scanning to identify surface defects such as knots, splits, rot, speck, beetle damage, etc. has led to grade-based recovery optimization, where boards are cut into lumber to obtain the highest grade as opposed to extracting the highest volume. Higher-grade output leads to higher dollar returns from the input wood fibre.

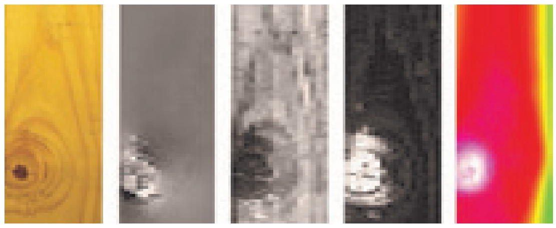
Colour scanning requires the addition of white light to illuminate the board surface and megapixel colour cameras to build high resolution colour images. Resolutions down to 0.25 mm are typical in today's high performance colour scanners.

Modular scanning with the Gocator 200

With the Gocator 200 series multi-dot scanners, a scanning system can now be designed based on a modular concept that mixes 3D profiles, tracheid, and colour, according to Arden. Colour, for example, may be used only on the wane up surface while profile and tracheid is used on both top and bottom board surfaces.

The Gocator smart sensor feature set offers onboard processing to configure triggering, exposure, resolution, board detection, filtering, stitching, measurement, built-in communication protocols to other factory equipment using Ether/IP, and advanced visualization.

"With an open source SDK, customers can build sophisticated scanning solutions and deliver unique capabilities that are specific to mill requirements," Arden said.



(left to right) colour, tracheid scatter, tracheid angle, knot detection, profile: (left to right) colour, tracheid scatter, tracheid angle, knot detection, profile

Stiched colour images of top and bottom board surfaces: Stitched colour images of top and bottom board surfaces

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