Automated Lumber Grading
Is it Finally Here?

It has been more than 20 years since automated lumber grading was first seriously pursued as a reality for the hardwood industry. Back then, several federal and university researchers were working on everything from log and lumber scanning to automated (or optimized) log breakdown to automated lumber grading and rough mill processing. At the peak of the excitement, researchers envisioned that automated grading stations would pass their digitized information directly to a rough mill’s chop or rip saws, or pass it along to the buyer of a load of lumber. Scanned data (length, width, thicknesses, location of defects) would stay with the board throughout its distribution and could be called up with a barcode or RFID tag and linked with the end-user’s cut-up optimization software to maximize yields. In addition, it was believed, as buyers and sellers began to trust the accuracy of automated grading, much of the labor-intensive, costly grading and re-grading throughout the distribution channel could be eliminated.

But, it never came to be. At first, the scanning detectors weren’t sophisticated enough to distinguish fine defects in boards. Then, the software wasn’t fast enough to process the vast amounts of data generated by better scanners. Then, federal funding ran out for solid hardwood research. Unfortunately, automated grading and processing never made it far enough into the demonstration or proof-of-concept phases to attract the capital investment that would have been required to finish development and bring it to market. Or perhaps, the end goal was too big and too distant to achieve in one giant leap.

Automated Grading Reborn
Dr. Rado Gazo of Purdue University hasn’t given up on scanning and automation, however, and is on the verge of finally bringing automated hardwood lumber grading to the market. Gazo started with CT log scanning many years ago, developing software to determine the best log breakdown pattern to maximize grade and value yield based on the scanned internal characteristics. Today, Gazo says there are five CT log scanners operating in the world—two in the U.S.—with another one or two in the pipeline. Because there are literally millions of ways to break down a log, Gazo had to develop faster and faster algorithms to “virtually grade” every board that might be sawn.

Hardwood Lumber Price Indexes

Indexes represent the average published prices of 7 key hardwood items. The margin is the difference in dollars between the kiln-dried and green indexes, as read from the right-hand axis.
His software is now able to grade hardwood boards in 5-20 milliseconds, which allows each log to be processed in 20 seconds. The original scanning technology of 25 years ago reportedly took 20 minutes per board.

With the lumber grading algorithms already developed for log scanning purposes, Gazo looked for other applications. European scanning manufacturer Microtec, maker of the Golden-Eye lumber scanner, already has more than 800 systems installed in the global wood industry. These systems are mostly for chip saw optimization and replace the human crayon marking system. But Gazo realized the GoldenEye scanners can detect all of the lumber characteristics necessary for successful grading to NHLA rules. Over the last 4-5 years Purdue University’s Hardwood Scanning Center and Microtec have been working together to bring automated hardwood lumber grading to market.

While many rough mills use some sort of scanners for optimization, these are designed to identify defects on surfaced lumber. The Purdue/Microtec system is specifically being developed for grading rough KD lumber, which will give the technology much wider application throughout the industry.

The partnership began with numerous small-scale test trials of limited numbers of boards and species. The successes have now progressed to the point that a couple of grading systems are being quoted by Microtec for installation, while a dozen other interested companies are awaiting the results of larger-scale tests, which have been delayed simply because the scanners are so difficult to come by. Every scanner the company makes is sold in advance, and on two occasions, the showroom demos were sold just prior to scheduled lumber tests. Fortunately, Gazo and his Microtec engineer currently have the use of a scanner for 3 months, and they are racing through the larger tests.

Their goal is to set up, calibrate and test the scanner for the nine most important commercial hardwood species in Indiana. They will scan 1,000 boards per species in #2/Btr grades. Their methodology is to intercept packages of lumber that have already been graded, then grade those same boards with the automated grading system so they can compare the automated grades to the human grades. Because the trials are still on-going, Gazo is unwilling to give firm answers about the accuracy of the automated grading system. However, he will say that, for the first two-thirds of sampled boards, the machine grading error was 1-2% for a typical package of lumber. The NHLA sales code requires 80% of the footage of a shipment to be on grade and for the total shipment to be within 4% of stated value. Most people readily admit that real-life errors can be larger than that, Gazo says, and his on-grade performance is in the low to mid-90s. So, the automated system would seem to have an accuracy advantage.

What Will It Do?

As already noted, the “big dream” that automated lumber grading would seamlessly feed into automating lumber processing and eliminate repetitive manual lumber grading may have been unrealistic. And, the Purdue/Microtec system isn’t intended to get us there...at least not right away. Gazo is not shy about saying that he sees no application for the scanned information downstream in the rough mill. “For lots of reasons, I would recommend people stay away from one-scanner solutions.” Gazo said, “Rather, people should look for dedicated equipment that does one task well.”

To that end, the new system is designed solely to provide “computer-assisted human grading.” The technology, he says, measures everything to the smallest pixel resolution, much more accurately than a human grader standing above or to one end of a board. Human override may be necessary, however, for correctly identifying barely perceptible areas of rot, mineral, burl, pin knots, etc. The certain benefits, Gazo says, will include increased accuracy, increased capacity (with the same personnel), and less need for investment if higher throughput is needed at the inspection station.

But, Gazo also quietly hints that he is intentionally underselling the system. “In my opinion, it is ready for industrial application. But, we need to take baby steps and not ‘over promise.’ I am sure that, as mill owners become more comfortable with the system, they will let it run more autonomously (which it is capable of doing). But, I want owners to make those decisions on their own.” In other words, Gazo believes mills may quickly promote the system from “assistant grader” to “automated grader.”

Ready to See It Run?

On March 28, at Pike Lumber Company, in Akron, IN, Gazo and his team invite you to watch them run the system through its final testing. “With this new generation of scanners,” Gazo says, “automated hardwood lumber grading is now becoming possible. People are flying in from all over to see it, and there is no better way to learn about it than to see it working. After we dismantle it in a month, you will have to go to the showroom to see it, where you will not get nearly the opportunity to examine it like in a sawmill.”

Gazo will run the demonstration at a speed of 400 feet per minute (fpm). The maximum speed of the system will be somewhere around 1,000 fpm depending on the scanner model. However, Gazo is not yet certain whether the system can pick up very small details at those top speeds. In addition, he notes, other material handling challenges arise at those speeds. “I believe speeds of around 500 fpm will be sufficient for most operations.”

The demonstration will begin at 9:30 a.m. and is co-sponsored by NHLA, NHILA and Pike Lumber Company. The $90 registration fee includes lunch. Find the meeting announcement and registration form on NHLA’s calendar at NHLA.com. For additional information about the technology, contact Rado Gazo at gazo@purdue.edu or (765) 494-3634.