Investment in New Control System Paying Back Quickly for Forest Products Manufacturer

By Don Denman
Senior Applications Specialist, Delta Computer Systems Inc.

Riverside Forest Products Ltd. is Canada's leading producer of softwood plywood and veneer and a major manufacturer of stud and random-length lumber, wood chips, finger-joint lumber and a range of value-added products, including treated railroad ties and plywood bins. The operations goal of the Riverside stud mill in Armstrong, British Columbia, is to maximize the amount of usable lumber that can be obtained from available logs.

The company is reaping big benefits from retrofitting the electronics that control the motion of its end-dogger log-processing line. This application is another example of a trend in industrial controls; machine owners are finding that significant productivity gains can be had by installing new control systems while controlling equipment costs by retaining the mechanicals of old machines. The new generation of controls is delivering on the promise of making older equipment move with greater smoothness and precision.

Riverside's Armstrong facility's end-dogger log line has been in operation since 1989. The old motion control system at the mill was a "black box," based around custom-coded proprietary control modules and unable to be tuned or modified easily to improve productivity. The new control system comes with special tools to simplify the tuning and optimization process. The mill operator has already realized more than a 10 percent improvement in the amount of saleable lumber obtained from raw logs, twice the forecasted improvement that was determined to justify the development project.

The foreground log has been scanned and is being fed into the canter head (at right). The arm that pushes the log into the canter is called a "dog." The background log at left is being held in an elevated position by hydraulic yokes as it is scanned. The laser lines are visible in red.

There are two keys to realizing the benefits: a new laser scanner/optimizer that generates optimal log-cutting solutions and an 18-axis motion control system. The scanner (made by Comact) employs 24 cameras and 72 lasers, arranged around the log to provide a 360-degree view of the log as it is held in place. All of the cameras take pictures at the same time, and filters are used on the cameras to ensure that each camera only sees the laser lines for the area that it is profiling. The result is a measured, virtual image of the log in space. The optimizing computer relies on this information to develop a list of instructions for the saws to cut the log to maximize the value of the finished lumber that is produced.

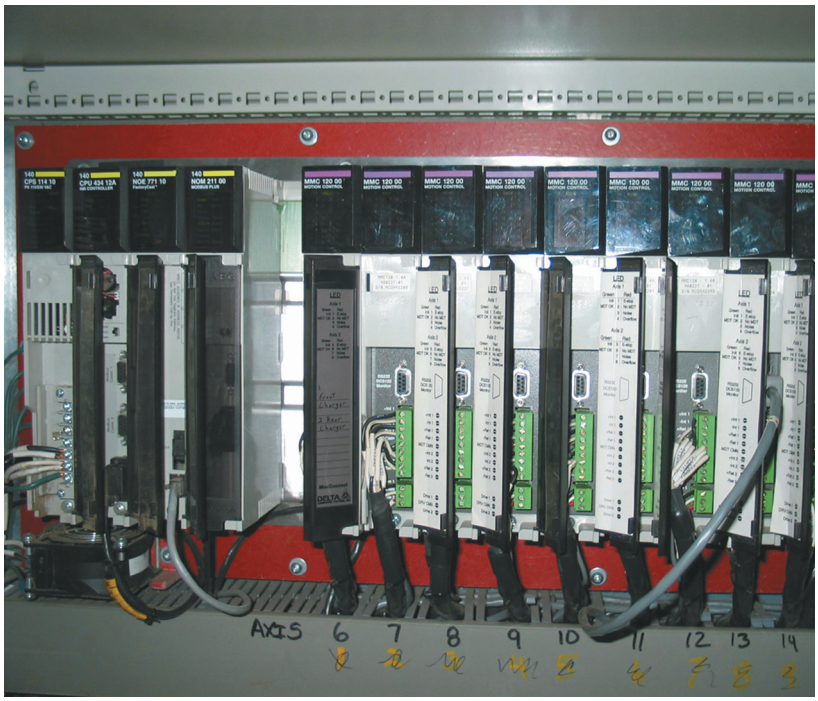
The machine uses a combination of precision hydraulics to position logs (that can range up to 18 inches in diameter and 8 feet in length) for scanning

Reproduced with permission from Robotics World including Motion Control. Douglas Publications, Inc. Copyright 2003.

and measurement, plus a heavy-duty electric motor that moves a 1.5-ton log carriage through the canter heads, chipping the log on three sides. The log carriage must accelerate from standstill to a rate of 650 feet/minute and then ramp down to zero velocity in the space of about 8 feet. Positioning and motion must be accurate to within a tolerance of 0.1 inch for the 250 HP DC drive controlling the carriage and 0.01 inch for the hydraulic setworks (the hydraulic arms that position the logs). The system is capable of processing 20 8-foot logs per minute, or more than 7,000 logs per eight-hour shift.

Delta Computer Systems' MMC120 motion controllers were selected for ease of programming and tuning, and ease of interface to the system's Modicon PLCs (the Delta MMC controllers plug directly into the Modicon rack). The engineers had previously tried a controller that had a less-powerful command set than the Delta controllers, but found that they couldn't meet the performance requirements of the design by using low-level motion commands generated by the PLC; the PLC interface became a bottleneck. Using the new controllers in a distributed control scheme, the PLC can initiate complex motion profiles (such as causing actuators to ramp up and ramp down velocity in an "S curve") with a small number of high-level commands.

The motion controllers also were required to coordinate the operation of multiple axes simultaneously. Different axes need to be tuned to ramp up and ramp down together, and during the scanning phase it is critical that all axes be completely stopped so that the log is held motionless while the pictures are taken. The Riverside system incorporates nine MMC modules controlling a total of 17 hydraulic axes. The 18th motion axis, the DC motor that drives the carriage, is controlled by a Delta Computer Systems RMC100 controller.



The Delta MMC motion controllers (lined up at right) are designed to fit in the same card cage as the Modicon PLC (at left). Each MMC120 handles two axes of hydraulic positioning.

The Delta hydraulic controllers get their axis-position information from MTS Temposonics magnetostrictive displacement transducers (MDTs), which are mounted in the hydraulic cylinders. MDTs are highly reliable and have the additional advantage of providing precise position information without requiring a homing step at the start of the motion cycle.

Programming the motion was straightforward: The Riverside electrical department started with a sample program provided by Delta that showed how the PLC communicates with the MMC120. Then they used Delta's development software to tune the operation of the axes. A key feature that the Delta software provides is the ability to plot the motion, including target and actual positions and velocities and drive output. As the motion parameters were adjusted, the electricians could instantly diagnose whether the performance of the system was getting better or worse by updating and examining the motion plots.

And the Riverside electrical department is not finished improving its machine's output. As they have time to make additional system improvements, the Delta controllers' diagnostics and tuning tools will help them make the changes and get back on line quickly. The maintenance department is so confident with its motion control solution that it intends to install Delta Computer Systems motion controllers in another machine as its next step in improving throughput. RW

DELTA COMPUTER SYSTEMS

Delta Computer Systems, Inc.
11719 NE 95th St., Suite D
Vancouver, WA 98682
www.deltamotion.com

Reproduced with permission from Robotics World including Motion Control. Douglas Publications, Inc. Copyright 2003.