Recent developments in Lumber Handling Systems

( A walk through a concept Trim/Sort/Stack line)

Gang Outfeed

- We begin at the landing table which receives a gang of boards.
- This landing table is equipped with servo-controlled, lugged sweep chains that are linked to the optimized gang saw pattern.
- Utilizing breakdown data from the MillExpert Cant Optimizer System™, the sweep chain servos control:
  - Index timing (based on log length)
  - High speed sweep distance, to bring the boards from the landing zone to the spill edge
  - Low speed indexing position(s) (based on cut patterns)
- The added servo control is needed to ensure a single layer of wood below
Smooth Flow

- Under normal operation a single layer progresses up an incline, toward the trim line.
- The incline c/w carry-over wheels acts as an Unscrambler bypass
- Provision is made in this line for deep pile storage capacity, should the Trimmer line have a long stoppage.

Surge Capacity

- When deep piling is needed, step feeders, lift skids, singulating cams and speed-up chains are used at the Unscrambler to re-establish a single layer.
- An operator is stationed after the Unscrambler during these rare times.
Virtual Lug Loading
US Patent App # 20080332532

• This line does not have a mechanical Lug Loader.
• A series of short, servo-controlled tables create board gaps, skew correct and adjust board position relative to the downstream lug chains.
• This method of lug loading can handle all sizes and qualities of wood equally.
• A MillTrak™ vision-based camera monitors flow and position of boards, and will alarm if anything is amiss. If double-ups are detected MillTrak™ will stop the system.
• MillTrak™ cameras are used throughout the line to:
  – Provide a redundant safety curtain to disable equipment if operators are inside the “no go zone”
  – Reduce or eliminate multiple photo-eyes
  – Detect skews, doubles and jams, and alarm as appropriate
  – Reduce the need for human eyes on the line

Secondary wood flow

• After the primary boards are placed into lugs, Edger and Resaw boards are introduced into the system.
• Overhead sequencing ducker tables are used to fill empty lugs “on demand”.
• MillTrak™ manages ducker sequencing, and creates empty lugs if needed.
Trimmer Optimization

- After blending primary and secondary board sources, all wood is scanned and optimized. A combination of laser and vision sensors in a Bio-Vision™ optimizer evaluate all lumber characteristics including:
  - Geometric size evaluation/classification
  - Knots, stain, check, warp, and other grade aspects
  - Machine center defects

- The optimizer interfaces with:
  - PLC for control of machine centers on the line
  - Other sensing devices such as moisture detectors
  - Upstream optimizers for communication of off-size trends, and other functions (using Millwide Web™)
  - Sales office for order entry, order complete, and solution weighting functions (using Dynastar Millwide management system™)
  - Operator devices such as Blackberry or I-Phone to provide information, alarms, and reports

- Proprietary or internal grades can be assigned. Boards can be sorted accordingly

Computer Room

- A number of interfaces are located inside the computer room:
  - WinTally™ Sorter Management computer manages bin functions and interfaces with PLC.
  - Optimization Decision Processor manages value tables and interfaces with MillWide Web™
  - HMI interface provides graphical representation of all devices (I/O) in the system, and their status. Predictive diagnostic alarms advise when to change components or adjust settings, resulting in optimized maintenance. Production flow is tracked and graphically displayed.
  - Millwide web, Controllogix PLC interface and others
Operator(s)

- Operator consoles use a wireless PC interface. Fixed consoles are not required. Operators are free to move about the mill.
- In the event a system failure is detected, the appropriate personnel are alarmed via wireless text messages.
- An operator standing in a designated area receives status information specific to that group of machines.
- Related maintenance and diagnostic information is available at the machine through "online help files"
- Alarms are configured in many forms:
  - Predictive failure warnings using trended information (slow cylinder) or local devices (hot bearing)
  - Scheduled maintenance alerts (saw mile tracking)
  - Production reporting (lug rates, production volumes)
  - Quality control trending (off size alarming)
  - Operational (bin #10 is now full)
  - Critical (no bins available)
  - Fatal (askew board – zone 3)
  - Emergency E-Stop (operator inside boundary)

Positioning and Trimming

- Positioning accuracy is greatly improved using a rotary positioning fence.
- New high speed Trimmers with tunable air cylinders and latest generation saws allow very tight lug spaces and very fast lug rates.
- Optimized decisions include fence, trim, cut-in-two, PET trim, etc.
- Linear actuators such as Exlar, CLD, Temposonic are used to shift saws “on the fly”.
Servo Drives

- Multiple drives are utilized, slaved to the main system drive. These secondary drives are servo controlled for position and speed.
- Servo drives can be made to change velocity briefly (for skip-a-lug) or for lengthy periods (cut-in-two batch runs).
- By using multiple servo drives, power transmission is simplified. Chain stretch is minimized on tag drives, main drives are smaller, power consumption is reduced.
- Servos have feedback loops and self diagnostics to feed information to the control system
  - Monitor amperage spikes and shut down system for jams.
  - Monitor system resistance and increase lubrication when required.

High Speed Drop Gates, Ending Transfer

- System speeds over 150LPM require overhead pusher gates instead of chain driven gates. The "smart" diverters have individual air cylinders for cut-in-two, trim save, and cut-out-of-the-middle functionality.
- Reman and short boards are dropped out
- Boards proceeding to the Sorter are ended to a common lumberline, then some boards are RF tagged prior to entering bins.
- RF Technology is emerging and may soon replace conventional bar coding
High Speed Sorting

- Pusher and drag chain Sorters replace J-bars, allowing high speed operation
- Variable speeds and dynamic diverter timing are controlled by PLC & WinTally™
- Extra bins are needed to allow moisture and internal grade sorting
- Sorters are equipped with soft drop arms, live bin walls, de-stacking kickers, clean up chains and auto-lube points. “Bin chaser” operators are no longer required, and maintenance is minimal.
- The WinTally™ loads, indexes, dumps and re-sets a bin without operator intervention.

Package Tracking

- Once discharged from the Sorter, package information is held in an RF tag database.
- Packs are tracked at several queuing locations, and displayed on the HMIs in the computer room and at the Stacker.
- An RF detector at the Unscrambler pocket configures the Stacker for specific pack requirements (pre-course make-up position, tier retainer position, number of tiers, number of sticks, fork cycle speed, etc.).
Stacking

- Stacker Unscrambler is equipped with step feeder infeed, lift skids, speed-up chains and rake-off device, ensuring a single layer blanket at the Stacker infeed chains.
- The Pre-course make-up device adjusts tier width as desired by product and grade.
- Stacker chains, forks and hoist are variable speed electric. Hydraulics are eliminated.
- Stacker self-configures and auto-cycles. Stick system is also automatic.
- An operator is present but has little to do.
- Milltrak™ monitors the flow and knows when to index the next pack to the Unscrambler.

Package Outfeed

- Packages index automatically from the Stacker hoist to the forklift pick-up.
- The forklift is equipped with an RF detector, and package information is made available to the operator.
- The RF data can be used to identify package sizes, grades, moistures, etc. Operators can then determine mill storage locations and drying programs.
- RF data ties to inventory management systems, providing live inventory and status reporting for each package.
- RF tag data may survive the kilns. If so, it will provide dry inventory reporting and will pass information from the sawmill scanner to the optimized planermill.
In Conclusion

- The mill in this presentation does not yet exist, but the technology for it does. Any or all features presented could be provided to a mill today.
- Products unique to USNR include:
  - MillExpert Cant Optimizer System™
  - Dynastar Millwide Maintenance Management System™
  - MillWide Web™ Software
  - BioVision™ Optimization
  - MillTrak™ vision cameras
  - WinTally™ Sorter Management
  - Virtual Lug Loading (patent pending)

Thank-you for your interest!

Geoff Wight, AScT
Product Line Manager
Newnes/McGeehee
A Division of USNR