Using Motion Control to Optimize your Material Handling

New England Kiln Drying Association

Who is TS Manufacturing?

Founded in 1972
Family business focused on the Lumber Equipment Industry
Based in Ontario, Canada - with clients worldwide

Focused on providing efficient, engineered solutions for Sawmill Markets - especially those underserved by traditional, large manufacturers.

This need for specialized equipment is why we adopted Motion Control to help us solve some specialized challenges that were amplified with our customers’ needs.
Conventional ‘Motion Control’ in a Dry Mill

01 Linear Fence for Trimmer
- Offers Increased Precision and Recovery to accurately recover solutions provided Modern Optimization and Scanning
- Typically Using Hydraulic Linear or Electric Positioning

02 Flying Saw for PET Solutions
- Flying Saws positioned by either Electric or Linear Hydraulic allow for rapid changeover in PET or Special Length Products

03 Planer / Moulder Head Positioning
- With Motion Control – Cutting Heads, Bed Plates, Rolls, Side Heads, etc can all be set quickly for difference sizes

Conventional Position Control

Or – Why don’t you just call them VSD’s?

Position Control vs Speed Control
- Typical Systems using VSD’s practice what is known as speed control.

Typical Loop
- Encoder Tells Position to PLC - PLC Requests Frequency Change from VFD – Motor Accelerates or Decelerates – Encoder Updates PLC
- Everything from the speed command to the position and even calculating the velocity needs to be specially programmed in the drive.
- Position feedback is typically ‘I went fwd or backwards X pulses

Loop Response of > 2ms
Motion Control
Start with the End – Let the Drive do the Work

Position Control by the Drive
Drive told to Move W Distance at X Accel, Y Speed, Z Decel from PLC
Drive updates PLC of Position, Speed, Etc and ‘When its Done’.

Drives Communicate with Other Drives
Directly
 Allows complex motion control to often be done with a single Instruction.
 Camming, Gearing, Robotic Control
 Examples : Lug to Lug Timing Flying Cut off Saw Curve Sawing Gang matching Changing Feed Speeds

Loop Response of 0.125 ms or less = 16x faster

Tilt Hoist Linearization

01 Production Rate Required Reduced Between Pack Cycle Rate
Future Requirements Restricted Ability to Use Continuous Tilt Hoist due to Height Requirements
Customer Budget also did not allow for Continuous Hoist

02 Fillet Breakage was Significant with Lugged Decline
Customer was breaking between 200,000 and 300,000.00 USD per year at Lugged Decline
Fillet Placement (300mm) required ‘Slide’ system to minimize interference and breakage

03 Short, Thin Boards Skew and Jam Unscramblers
The Shortest boards were equal to the Package Width causing potential for boards to Skew perpendicular to layer if not discharged from top of package smoothly
Linear Moving Tilt Hoist – Provides Production Rate between Conventional and Continuous Tilt Hoist – With Less Broken Fillets

Tilt Hoist Linearization

Retrofits:
- Can achieve ‘good enough’ linearization by Linearly Driving the – Hydraulic Unit.
- Saves added cost of Temposonic Cylinders, Tilt Hoist Modifications
- Just need Servo Driven GearPump, and Bosch Pressure / Proportional Valve and Controls
Graderless Optimization allows Higher Lug Speeds

With the advance of Graderless Optimization – many bottlenecks can be removed in a previously manually graded line.

Conventional Cut In Two with Make a Lug has Upper Speed Limits

Conventionally programmed ‘Make A Lug’ often uses the VFD to ‘rapidly slow’ the one transfer to make an empty lug behind the Ci2 board. As lug speeds increase this rapid decel exponentially increases – causing it to become untenable.

The ‘Inhibit Lug Loader’ Make a Lug System takes a lot of Space

In Systems without sufficient space between the Trimmer and the Sorter for a ‘Pickup and Return’ system, the mechanical costs to enable higher lug speed can exceed Optimization Costs. One Competitor went as far as to install Two Sorters to work around this issue!

CIP Motion Camming Can allow Make a Lug at Speeds up to 200 lpm

With the Motion Control system handling position commands more complex ‘Decel Curves’ can be easily plotted and followed – allowing for Decel rates to be significantly lower.
Typical ‘Geared’ Profile
1:1

Complex ‘Make a Lug’
Programmed in Only 7 Pts!
Some Items Patented or Patents Pending

Other ‘Complex’ Camming Solutions to Material Handling Issues

Motion Control Systems provide more reliable measures of Velocity

01. With more accurate ‘Real Time’ velocity measurements – ‘Variable Timing’ doesn’t make sense – its

02. Variable Position – CIP Motion enables ‘trigger positions’ to be infinitely variable – eliminating Troublesome

03. Speeds – without Complex Programming

Less Sensors Required to Run Systems

01. Instead of needing Photocells to ‘Slow Down’ and ‘Stop’ items reliably – Motion Commands do this without

02. needing sensors

Queue Hook Timing vs Position Programming

03. Instead of having multiple timers for different speeds – you can trigger off of positions – 300mm is 300mm

04. at any speed. Even if it changes speed in the middle

Position vs Timing
Some Items Patented or Patents Pending

Camming on Stacker & Package Maker for Difficult Lumber and ‘Air Gapping’

Maintenance

Somebody has to love the machines.
Thank you for your time!

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