Lean Manufacturing for the Wood Products Industry

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Product Leadership
Operational Excellence
Customer Intimacy

Source: Treacy and Wiersema 1995
Presentation Overview

- Overview of lean manufacturing
  - 8 Wastes
  - Lean tools
- Examples of lean companies
- How to do it!
NRRI Mission

“To enhance near-term economic development of Minnesota’s natural resources in an environmentally responsible manner.”

Forestry/Forest Products works with 150+ companies and cooperators/year in Minnesota, Wisconsin, the Great Lakes region and throughout the world.
Key Industry Issues in the Midwest

- 300,000+ employed in MN, WI, MI, IA
- 100,000 in primary (logging, lumber, paper and composites)
- 200,000 in secondary (fenestration, millwork, cabinetry, flooring, furniture, and store fixtures among others)
To help companies understand and implement lean . . .

Our efforts have focused on:

- Building capacity using wood specialists
- Customized wood industry manufacturing simulations
- Training in lean principles and transformations
- Tours of best practices
- Facilitating initial project teams
  - Kaizen blitzes
  - Multiweek events
What is Lean Manufacturing and Continuous Improvement?
Lean Is ---

- A philosophy for systematic change and continuous improvement.
  - Develop long-term thinking and clear philosophy.
  - The right process will produce the right results.
  - Add value to your organization by developing your people and partners.
  - Problem solving can drive organizational learning.
By accomplishing these activities we see more employee involvement.

The ultimate Goal $\rightarrow$ increased profit and competitiveness.
The Work

- Understand your value stream.
- Develop “eyes for waste” and remove it.
- Create process stability and flow.
- Standardize work and use visual controls.
- Change your culture by developing your people and partners.
- Become a learning organization through relentless reflection and continuous improvement.
Competitiveness = Time

“One of the most noteworthy accomplishments in keeping the price of Ford products low is the gradual shortening of the production cycles. The longer an article is in the process of manufacture and the more it is moved about, the greater is its ultimate cost.”

Henry Ford, 1926
Historic Ford Sawmill, Alberta, Michigan
Competitiveness = Waste

TPS is a management system in which the people are fully expected to fully utilize the facilities and machines to satisfy customer requirements while working towards absolute elimination of waste.

Taiichi Ohno
President Toyota Motors
What is Value?

- Anything that someone is willing to give up or use resources for...
What is Waste (Non-Value)?

- Anything that consumes resources without returning any value.
Production Control

Weekly Schedule

- Sawmilling
  - 374 MBF
  - C/T=6m
  - 6 min
  - 5 days
- Stacking
  - 35 MBF
  - C/T=3m
  - 3 min
  - .5 days
- Drying
  - 1.5 MMBF
  - F/T=15d
  - 15 days
  - 22 days
- Planing
  - 1 MMBF
  - C/T=2m
  - 2 min
  - 15 days
- Shipping
  - 1 MMBF
  - VA = 15 d
  - LT = 57.5 d

Timber Sale Inquiry
Invoice
Weekly Orders
Pricing Report
Customer

Weekly

Sawmilling

374 MBF

Weekly Schedule

VA = 15 d
LT = 57.5 d
The Seven Deadly Wastes + 1

- Defects
- Overproduction
- Waiting
- Not using the talents of our people
- Transportation
- Inventory
- Motion
- Extra processing
Los Siete Desperdicios

- Sobreproducción
- Transporte
- Movimiento
- Tiempo de espera
- Exceso de procesado
- Inventario
- Desecho
Waste of Making and Correcting Defects

- Money and time wasted to find and fix mistakes/defects
- Causes
  - Lack of process controls
  - Poor quality of incoming materials
  - Lack of planned maintenance
  - Inadequate education and training, standards
  - Poor product design
  - Customer needs not fully understood
Waste of Overproduction

- Making products **Faster** than needed!
- Making products **Sooner** than needed!
- Making **More** product than needed!
Waste of Waiting

- Time lost when people, material or machines are waiting

Causes
- Unbalanced work load
- Equipment breakdowns
- Batch processing
- Long set-up times
- Poor material handling
- Scheduling practices
Waste of not using the talents of our People

- Considered by many to be the greatest waste... the wasted potential for improvement that results when the people doing the work are not asked for their ideas on improving the manufacturing process.
Waste of Transportation

- Transporting parts and materials around the plant
- Causes
  - Poor plant layout
  - Large batch sizes, long lead times, large storage areas
  - Human nature – expand to fit the room available
Waste of Inventory

- Material in excess of the one-piece required for production
- Causes
  - Inventory held just-in-case problems arise
  - Non-level scheduling
  - Poor market forecasts
  - Unbalanced workload
  - Unreliable shipments by suppliers
  - Reward systems based on individual efficiencies
  - Offal; left over material
Waste of Motion

- Any movement of people or machines that does not add value to the product.
- Causes
  - Poor ergonomics
  - Poor facility or machine layout
  - Poor workplace organization and housekeeping
  - Sorting/looking for items
Waste of Extra Processing

- Activities that add no value to the product or service from the customer’s point of view
- Causes
  - To meet perceived customer needs
  - Unnecessary paperwork requirements
  - Redundant approvals/inspections
  - Unnecessary reports
Lean Building Blocks

Continuous Improvement

Teams | TPM | Pull/Kanban | Cellular/Flow
Changeover Reduction | Batch Reduction
Visual Control | Supermarkets | Quality
5S | Standard Work | Plant Layout

Value Stream Mapping

[Diagram showing Lean Building Blocks]

[Logos: UMD Duluth, Natural Resources Research Institute]
Teams
5 “S” – The 5 Pillars of the Visual Workplace

- Scrounge
- Steal
- Stash
- Scramble
- Search

- Sort – Clear out rarely used items
- Straighten – Organize and label a place for everything
- Shine – Clean it
- Standardize – Create procedures to maintain the first 3S’s
- Sustain – Use regular audits.
Mill Work
Benchs Before
After
Standard Work

Operations safely carried out with all tasks organized in the best known sequence, using the most effective combination of:

- People
- Materials
- Methods
- Machines
### Work Elements

<table>
<thead>
<tr>
<th>No.</th>
<th>Work Elements</th>
<th>Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receive logs.</td>
<td>Take the logs from the Scrugg and inspect the trimmed off sides. All waste and trim should go in the slab chain.</td>
</tr>
<tr>
<td>2</td>
<td>Inspect logs.</td>
<td>Check both sides of the log before running through the bull edger. If the log does not meet length or yield specs discard it in the slab chain.</td>
</tr>
<tr>
<td>3</td>
<td>Move to feeder</td>
<td>Move log to bull edger feeder and line up on green line.</td>
</tr>
<tr>
<td>4</td>
<td>Determine size.</td>
<td>Use shadow markers to determine the board's width. Change the controls to accommodate the size.</td>
</tr>
<tr>
<td>5</td>
<td>Feed into machine</td>
<td>Keep hands and loose clothing clear of log while it enters the Bull Edger.</td>
</tr>
<tr>
<td>6</td>
<td>Sharpen blade.</td>
<td>Sharpen the bull edger blades as needed or during downtimes as a preventative maintenance tool. Refer to the standardize procedure sheet for sharpening instructions.</td>
</tr>
<tr>
<td>7</td>
<td>Clean machine.</td>
<td>Periodically throughout the day and at each shift change clean the bull edger and the area surrounding it, especially the floor. This helps prevent accidents.</td>
</tr>
</tbody>
</table>

### Key Points

- **Safety**: Use shadow markers to determine the board's width.
- **Quality**: Keep hands and loose clothing clear of log while it enters the Bull Edger.
- **Technique**: Sharpen the bull edger blades as needed or during downtimes as a preventative maintenance tool.
- **Cost**: Periodically throughout the day and at each shift change clean the bull edger and the area surrounding it, especially the floor. This helps prevent accidents.

### Time Elements

<table>
<thead>
<tr>
<th>Time</th>
<th>Auto</th>
<th>Manual</th>
<th>Wait</th>
<th>Walk</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 s</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10 s</td>
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<td>5 s</td>
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<tr>
<td>5 s</td>
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</tr>
</tbody>
</table>

### Key

- **Safety**: Use shadow markers to determine the log widths.
- **Poka Yoke**: Log feeds into here.
- **Quality**: Keep hands and loose clothing clear of log while it enters the Bull Edger.
- **In-Progress Stock**: Shadow marker.

### Work Area Layout

- **Company**: Cass Forest Products
- **Date**: 9/5/2006
- **PPE**: Safety glasses, Steel toe boots
- **Tools**: 

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**Note**: This worksheet outlines the standard operating procedures for a Bull Edger machine in a forest products company. It details the work elements, key points, and time elements required for safe and efficient operation.

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**Image Description**:

- The image on the right side of the worksheet shows a Bull Edger machine with buttons that determine the log widths. The shadow marker is used to line up the logs on the green line.

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**Additional Notes**:

- The middle section of the worksheet includes a breakdown of the work elements with specified times and key points.
- The Key section highlights the importance of safety measures and maintenance procedures.
- The Time Totals section shows the total time taken for each task.
Flow
Supermarkets

- Visual control --- Like shelves in a supermarket, stock is replenished based on demand (customers go there to “shop”)

- Communication between links in value stream w/o a written production schedule

- “Supermarket” has limited capacity to minimize WIP and/or finished goods inventory
Changeover Reduction

- Definition: The time between the last good piece off the current run and the first good piece off the next run
- Before Shigeo Shingo’s “Single Minute Exchange of Die” (SMED), typical setup tasks and time breakdowns:
Visual Control
Total Productive Maintenance

A total quality management strategy focusing on improving equipment effectiveness and reliability. It is upper level directed and bottom driven.

- Reduce maintenance costs
- Eliminate equipment downtime
- Increase productivity
- Achieve a clean and safe workplace
- Provide proper training
- Establish open communication
- Promote operator ownership of equipment
- Measure maintenance performance
- Sustain the improvements and gains
TPM Goals

- Reduce maintenance costs
- Eliminate equipment downtime
- Increase productivity
- Achieve a clean and safe workplace
- Provide proper training
- Establish open communication
- Promote operator ownership of equipment
- Measure maintenance performance
- Sustain the improvements and gains
Visual example of a Lean Office
Value Stream Walk-through
Current Process

Purchase Order → Work Order
Receive PO
Check Pricing
Wait for Information from Customer
Receive Information
Create Yellow Sheet
Enter Partial Order Information
Copy Yellow Sheet
Deliver Yellow Sheet to Production Control
Deliver Yellow Sheet to QC
Receive information
Look up Revision
Record Revision
Compare Information
Deliver to Customer Service
Deliver to QC
Place in In Box
Make Copies
Highlight Recipients
Deliver to QC
Deliver to Tool Room
Deliver to Production Control
Wait
Confirm Inventory
Create Sales Order
Create Work Order
End of Process

44 Process Steps
5 People Involved
8 Waits
1897’ of Travel
Typically 2-4 Weeks to Complete
New Process
Call Customer
Create Sales Order
Look up Revision
Compare Prints
Check Material
Check Date
Create Work Order
End of Process

- 10 Process Steps
- 1 Person Involved
- 0 Waits
- 0’ of Travel
- 26 Minutes to Complete
Merillat Industries wins 2003 Shingo Prize

Atkins, Virginia cabinet plant
Results in 5 years

- Plant Lead Time reduced from 6 days to 14 hours
- Plant quality improved 84%
- Plant safety improved 98%
- WIP reduced by more than 80%
- On-time complete 99.7%
- Up-time above 99%
- Plant capacity doubled with virtually no capital
- Average lot size went from over 200 to 25
- Added new species offerings with rapid changeover
- Doubled SKU offering
- Plant floor space freed up 70,000 sq ft
- Production cost maintained below inflation
Jared is lean … What about Foldcraft?
Results Achieved ‘98-’04:

• Process Lead-Time ↓ 66%
• Floorspace ↓ 42,000 sq. ft.
• Productivity ↑ 240%
• Claims ↓ 48%
• On-Time Ship 95.2% ➔ 99.3%
• Significant product expansion
• Insourcing previously purchased items
Assistance is Everywhere

- www.lean.org
- Local lean manufacturing extension partnerships
- Talk to industry adopters
- Buy a book and get started
- Attend a short course
- Hordes of lean consultants
To help companies understand and implement lean...

Our efforts have focused on:

- Customized wood industry manufacturing simulations
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- Tours of best practices
- Facilitating initial project teams
  - Kaizen blitzes
  - CI^8 - Multiweek events
Lean Manufacturing

Introduction to Lean Building Blocks

Bayport, MN Dec 11-13, 2006
Dovetail Enterprises

- Our goal will be to transform a traditional manufacturing system into a lean production system.
- Drawer Box Fabrication & Assembly
  - Order kitting
  - Dovetailing
  - Assembly
  - Sanding
  - Bottom assembly
  - Labeling
  - Material handling
- Customer
Sawmill Enterprises

- Our goal will be to look at lean implementation tools that could be applied in a sawmill during a transformation from traditional manufacturing system into a lean production system.

- Sawmill and molder/planing
  - Sales
  - Production scheduling
  - Sawmill
  - Dry kiln
  - Molding
  - Tool room
  - Material handling
  - Maintenance
  - Industrial engineering

- Customer
Changing the culture . . Lean is not Mean!
The Challenge

“Change is never easy… particularly when things are going well”

“By re-inventing ourselves…and our companies...regularly...we will better serve our customers...prosper...and preserve our planet for future generations.”

Fujio Cho
President
Toyota Motor Corporation
Assistance is Everywhere

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# Lean Implementation – How to Do It?

1. Top management and ownership must be fully committed to the culture of Lean and Continuous Improvement. If the full commitment is not there, don’t start the change.
#2 – Create a Lean Steering Team

- Select the team
- Create the team charter
- Train the team
  - Lean manufacturing
  - Continuous Improvement
#3 - The Steering Team Creates the Plan

- Create the vision for Lean manufacturing and Continuous Improvement
- Create the communication plan
- Create the training plan
- Document Steering Team expectations of employees, supervisors, the teams, and of management leadership
- Establish criteria for Lean project selections
- Define the structure for task teams
  - Project selection and duration
  - Team member selection process
  - Team boundaries
  - Team presentation
  - Team recognition
- Define the support and oversight structure.
  - Team sponsors
  - Team feedback process
  - Lean Manufacturing Process Coach
- Create the process for keeping score.
  - Lean measures
  - Visual measures
- Establish systems to sustain the gains.
  - Audit team
#4 – Do It!

- Create Task Team(s)
- Train all employees in Lean and Continuous Improvement
- Support Continuous Improvement by all members of Work Teams
- Involve everyone
- Keep Score!
- Celebrate!
Lean Outcomes

- Reduced work in progress
  - 25-90%
- Decreased lead times
  - 25-90%
- Increased floor space
  - 10-80%
- Workforce development
- Increased sales
- Cost reductions
- Improved quality
  - 5-80%
- Improved worker motivation and productivity
  - 25-70%
Ongoing Activities

Our team is continuing to work with new companies and is cooperating with our outstanding Manufacturing Extension Programs in Wisconsin, Minnesota, Michigan and Iowa by providing wood industry specific lean training and implementation assistance.
Thank you!