Lean Manufacturing

for small and medium sized wood products companies
Lean Manufacturing

Types of Waste that Lean Seeks to Eliminate or Reduce
The Burning Platform – Why Are We Here?

- Markets ➔ Meeting customer demand is a constant challenge.
- Globalization ➔ competing with everyone from everywhere for everything!
- Supply chain ➔ depend more than ever on suppliers, energy, transportation, etc.
- Work and information flows ➔ are opaque and complex
- What must we do ➔ ??
Every morning in Africa, a gazelle wakes up. It knows it must run faster than the fastest lion or it will be killed. Every morning a lion wakes up. It knows it must outrun the slowest gazelle or it will starve to death.

It doesn’t matter whether you are a lion or a gazelle, when the sun comes up, you had better be running.
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*
Lean - Definition

“Lean thinking, simply defined, is a method of doing more with less.”

- Creating value without waste
- Respecting people
Lean Thinking
Misconceptions

- Lean is reduction of labor force
- Lean is the same as “Just-in-Time”
- Lean can only be used in manufacturing businesses
- Lean is eliminating all inventory
- Lean is a number of rapid improvement events
- Lean doesn’t apply to small companies
- Lean is only for mass production
Lean Is ---

- A philosophy for systematic change and continuous improvement:
  - To align production capability with customer demand (smooth continuous flow)
  - To develop “eyes for waste”
  - To reduce “true” production cost
  - To increase flexibility & customer satisfaction
  - Learning and Leadership development

- The ultimate Goal → increased and *sustainable* profit
What is Value?

- Value-added
  - Shaping a part
  - Spraying a part
  - Assembling parts
  - Cut to size
  - Drill
  - Punch
  - Teach workshop
  - Write sales contract
How much of what we do is value?

- Non-Value Added
  - Overproduction
  - Defects
  - Unnecessary inventory
  - Inappropriate processing
  - Excessive transportation
  - Waiting
  - Unnecessary motion
What is “waste”? 

- Scrap?
- Defects?
- Bad work design?
- Injured employees?
- Inventory?
- Moving parts/products around?
Definition of waste

“waste is anything that, from the perspective of the customer, adds cost to a product or service but does not add value”
Definition of Value-Added

- Activities that increase the market form or function of the product or service (*things that the customer will pay for*)
- Conversely: non-value-added activities that do not add market form or function (*these should be reduced/eliminated*)
7 Types of Waste

- Non-Value Added
  1. Overproduction
  2. Defects
  3. Unnecessary inventory
  4. Inappropriate processing
  5. Excessive transportation
  6. Waiting
  7. Unnecessary motion
1. Overproduction

- Producing too much too soon resulting in reduced capacity to fulfill immediate demand
- Oftentimes the root cause of the next 6 wastes
2. Defects

- Communication errors in product quality
- Out-of-spec (wrong length, width, thickness, color, species, number of defects)
- Order entry & paperwork errors resulting in missed or incomplete shipments
3. Unnecessary Inventory

- parts/products do not result in profit for the company if they’re on a shelf, in a bin, or in a warehouse
- Holding high inventories reduces cash flows
- Inventory requires extra time, space, energy, and other resources to manage
4. Inappropriate Processing

- Forcing large batch production when shorter lead-times are needed
- Excessively complex processes with untraceable routings and rework
- Wrong level of technology
- Inefficient equipment, tools, procedures, or systems.
<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>76</td>
</tr>
<tr>
<td>Size</td>
<td>46” x 83.5”</td>
</tr>
<tr>
<td>Grade</td>
<td>7/16” 03B</td>
</tr>
<tr>
<td>Sold To</td>
<td>Horner Flooring</td>
</tr>
</tbody>
</table>
16 losses leading to inefficient processes

<table>
<thead>
<tr>
<th>Loss</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Failure/Breakdown</td>
<td><strong>Availability –</strong></td>
</tr>
<tr>
<td>2. Setup/Changeover/Adjustment</td>
<td>Losses that impede equipment efficiency</td>
</tr>
<tr>
<td>3. Cutting Blade</td>
<td></td>
</tr>
<tr>
<td>4. Start up</td>
<td></td>
</tr>
<tr>
<td>5. Minor Stoppage/Idling</td>
<td></td>
</tr>
<tr>
<td>6. Operating below design speeds</td>
<td></td>
</tr>
<tr>
<td>7. Defect/Rework</td>
<td></td>
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<tr>
<td>8. Scheduled downtime</td>
<td></td>
</tr>
<tr>
<td>9. Management Errors</td>
<td><strong>Performance –</strong></td>
</tr>
<tr>
<td>10. Excessive Operator Motion</td>
<td>Losses that impede human work efficiency</td>
</tr>
<tr>
<td>11. Line Organization Errors</td>
<td></td>
</tr>
<tr>
<td>12. Logistics Errors</td>
<td></td>
</tr>
<tr>
<td>13. Measurement/Adjustment Errors</td>
<td></td>
</tr>
<tr>
<td>14. Energy</td>
<td><strong>Quality –</strong></td>
</tr>
<tr>
<td>15. Die, Jig, Tool Degrade or Breakage</td>
<td>Losses that impede effective use of resources</td>
</tr>
<tr>
<td>16. Yield</td>
<td></td>
</tr>
</tbody>
</table>
5. Excessive Transportation

- Unnecessary movement of goods or information
- Unnecessarily long distances between machines or departments
- Repetitive movement of goods in and out of storage
- Duplication of work
6. Waiting

- Long periods of inactivity for people, information, or goods resulting in poor flow and long lead-times
- No “rhythm” established
- Searching for tools
- Starting and stopping (binge and purge)
7. Unnecessary Motion

- Poor workplace organization resulting in poor ergonomics—wasted walking, bending, stretching, etc.
- Increased worker injury
- Decreased worker morale
- High insurance premiums
# Energy Use Hidden in Waste

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Energy Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overproduction</td>
<td>• Energy consumed operating equipment to make unnecessary products</td>
</tr>
</tbody>
</table>
| Defects                  | • Energy used in making defective products  
|                          | • More energy used for rework and repair efforts                                                                                  |
| Unnecessary Inventory    | • Energy used to heat, cool, light, and manage inventory storage and warehousing space                                                   |
| Inappropriate Processing | • Energy consumed in operating equipment related to unnecessary processing  
|                          | • Use of not properly maintained equipment results in more energy use per unit of production                                          |
| Transportation           | • Energy used for excessive transport  
|                          | • Energy used to heat, cool, light, and manage larger spaces required for more transport capacity                                    |
| Waiting                  | • Energy used to heat, cool, light, and manage while down                                                                               |
| Unnecessary Motion       | • Use of less productive workforce results in more energy use per unit of production                                                      |
Value Stream Map – Process Level

**Summary:**

- **WORK**: 2 Steps, 12%
- **MOVE**: 9 Steps, 57%
- **CHECK**: 3 Steps, 19%
- **WAIT**: 2 Steps, 12%

- Notify lift operator to bring raised core
- Push out empty pallet
- Lift truck removes empty pallet
- Lift truck moves core
- Push raised core onto line
- Get tickets
- Sort tickets
- Program computer
- Place core onto saw infeed
- Push button to start auto cycle
- Saw auto cycles for 15 seconds
- Inspect parts
- Stack down
- Write quantity on ticket
- Push ticket onto load
- Push load out
- Place ticket onto load
- Push empty pallet
- Lift truck removes empty pallet
- Lift truck moves in a pallet of raised core
- Push out empty pallet
- Lift core
- Push ticket onto line
Value Stream Map – Business Level

- **Office**
- **Orders**
- **Price Rpt**
- **Solicitation**
- **Wkly Sched**
- **Invoices**
- **Sales Notices**
- **Price Speculation**
- **Kiln Schedule**
- **Needs**

**Sawmill**
- 1/2 MMBF Logs
  - 5 d
  - 6.1 m

**Stacker**
- 35 MMBF In sorter
  - 0.5 d
  - 3 m

**Kiln**
- 1.5 MMBF Green
  - 22 d
  - 18 h

**Kiln Schedule**
- 1 MMBF Cooling
  - 14.7 d
  - 6.2 m

**Planer**
- 1 MMBF Finished
  - 14.7 d

**Customer**
- 340 MBBF weekly

**L/T = 57 d**
- **V/A = 18.3 h**
Improvement Methods

**Structure and Support**
- Plans
- Improved systems for equipment care
- Equipment focused
- Operator involvement
- Visual impact
- Team based
- Improves reliability

**Lean**
- Process oriented
- Eliminate waste
- Reduce cost

**Value-Stream**
- Data driven
- Structured problem solving process
- Quantifiable results

**TPM** (maintenance)
- Eliminate variation
- Improves reliability

**Six Sigma**
Lean Building Blocks

Continuous Improvement

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

Value Stream Mapping

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Some Final Words on Waste

- There is more to waste in a manufacturing facility than first meets the eye. Think outside the hog belt.
- Rule of thumb: always ask yourself: “Is this activity adding value for my customer?”
- Eliminating/reducing these wastes reduces business cost through minimizing lost production, time, and energy.
- Map it, locate it, attack it!