Lean Manufacturing for the Wood Products Industry

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Natural Resources Research Institute
NRRI Mission

“To foster economic development of Minnesota's natural resources in an environmentally sound manner to promote private sector employment.”

Forestry/Forest Products works with 150+ companies and cooperators/year in Minnesota, Wisconsin, the Great Lakes region and throughout the world.
Wood Industry Sectors Served by NRRI

- **Primary**
  - Lumber, OSB and composites, Paper residues, Pulp
- **Secondary**
  - Cabinetry
  - Millwork and Fenestration (windows)
  - Recreation Products
  - Wood Flooring
  - Wood Finishing
  - Furniture (residential and office)
  - Store fixtures
  - Housing
  - Transportation
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)
Key Industry Issues

- Slow implementation of new technology and best manufacturing practices
Key Industry Issues

- Imported products/overseas manufacturing
Great Lakes Wood Manufacturing Partnership

- Enhance the competitiveness of the wood products industry in the western Great Lakes region of Minnesota, Michigan and Wisconsin by completing company specific projects

  - Through implementation of lean manufacturing and product development
<table>
<thead>
<tr>
<th>Partners</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public</strong></td>
<td><strong>Minnesota</strong></td>
</tr>
<tr>
<td>Natural Resources Research Institute/UMD</td>
<td>Training – 18 companies</td>
</tr>
<tr>
<td>Northern Initiatives (Marquette, MI)</td>
<td>Lean projects – 7 companies</td>
</tr>
<tr>
<td>Michigan Technological University</td>
<td><strong>Wisconsin</strong></td>
</tr>
<tr>
<td>Minnesota DNR</td>
<td>Training – 12 companies</td>
</tr>
<tr>
<td>Wisconsin DNR</td>
<td>Lean projects – 5 companies</td>
</tr>
<tr>
<td>Michigan DNR</td>
<td><strong>Michigan</strong></td>
</tr>
<tr>
<td>Iowa DNR</td>
<td>Training – 16 companies</td>
</tr>
<tr>
<td>USDA Forest Products Laboratory</td>
<td>Lean projects – 6 companies</td>
</tr>
<tr>
<td>Northwest Wisconsin Manufacturing Outreach Center</td>
<td></td>
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<tr>
<td>Michigan Manufacturing Technology Center (Grand Rapids, MI)</td>
<td></td>
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<tr>
<td>TEAMWORKS (Park Rapids, MN)</td>
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<tr>
<td>CIRAS (Iowa State University)</td>
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</tbody>
</table>

New companies are being added as projects are initiated. Grant funding will continue through 2006.
Changing the culture . . Lean is not Mean!
To help companies understand and implement lean . . .

Our efforts have focused on:

- Customized wood industry manufacturing simulations
- Training in lean principles and transformations
- Tours of best practices
- Facilitating initial project teams
  - Kaizen blitzes
  - CI^8 – Multiweek events
Lean Manufacturing

Introduction to Lean Building Blocks

Sloan Foundation
Forest Industries Center at Virginia Tech
and
University of Minnesota Duluth’s Natural Resources Research Institute
presents the 6th Lean Manufacturing Workshop Series for Wood Products

Virginia Polytechnic Institute and State University
Reaching Higher

May 8-10, 2006
Wood Education and Resource Center
Princeton, West Virginia

www.forestindustries.vt.edu
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
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

Lean Manufacturing for the Wood Products Industry
Bayport, Minnesota
7 Types of Waste

1. Overproduction
2. Defects
3. Unnecessary inventory
4. Inappropriate processing
5. Excessive transportation
6. Waiting
7. Unnecessary motion
8. Not using the talent of your employees
Lea Manning for the World Products Inustry
Bayport, Minnesota
Leaven Manufacturing for the World Products
Bayport, Minnesota
Lea Manufactory for the World Products Industry in Bayport, Minnesota
Customized Wood Industry Manufacturing Simulations
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
Scorecard for Sawmill Enterprises

<table>
<thead>
<tr>
<th>Sales Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>Complete Orders of 50</td>
<td>$ 5.00</td>
<td>0</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Late/Partial Orders</td>
<td>$ 2.50</td>
<td>50</td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Costs Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Labor ($ per hour)</td>
<td>$ (20.00)</td>
<td>16</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Number of Associates</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Materials ($ per part)</td>
<td>$ (2.50)</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>WIP ($ per part)</td>
<td>$ (1.50)</td>
<td>200</td>
<td>150</td>
<td>0</td>
</tr>
<tr>
<td>Factory (cost per table)</td>
<td>$ (10.00)</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total** | $ (904.00) | $ (698.67) | $ 420.00 | $ - |
Dry Kiln
Tool Room
Molder
Wood Education and Resource Center --- Princeton, WV

Weekly Customer Production Control

Weekly Orders

Pricing Report

Shipping Schedule

Customer

1.36 MMBF monthly

Weekly

Timber Sale Inquiry

Invoice

Milling/Stacking

Drying

Planing

Shipping

Daily

C/T=6m

F/T=15d

C/T=2m

VA = 15 d

LT = 15 d

1 day

6 min

10 days

15 days

2 days

2 min

2 days

Shipping Schedule

C/T=6m

F/T=15d

C/T=2m

VA = 15 d

LT = 15 d
Project Facilitation for Wood Products Companies

A good way to understand the potential for lean implementation!
The Process

- Value stream mapping is used to identify potential continuous improvement projects.
- Projects are selected and conducted using a Kaizen blitz or a once a week, 4-8 week process.
The Process

**Step 1 - Company selects a project**
- Must be measurable with significant impact
- Boundaries established

**Step 2 – Conduct the project**
- Create team charter
- Lean training
  - Continuous improvement
  - Lean manufacturing tools
    - Value stream mapping
    - Pull inventory replenishment systems
    - Setup reduction
    - Cellular manufacturing
The Process

Step 3 - Meeting of all team participants plus company top management

- Team presentations to the group
  - Full team participation
  - Use visuals - Powerpoint presentation, video, digital photos, etc.
  - Metrics of accomplishment
CI Team Projects

- **Rockland Industrial Products**; “Products that Rock”
  - Developed and implemented a strategic R&D process to guide new product development

- **Crystal Cabinet Works**; “B and G Drawers”
  - Converted the cabinet drawer assembly area from a batch to a flow assembly process resulting in 15% productivity gains and 40% floor space reduction

- **TrueRide**; “The Streamliners”
  - Conducted a kaizen blitz resulting in 4,000 sq ft of floor space reduction and improved production flow of skate ramp manufacturing

- **Horner Flooring Company**; “Panel Pushers”
  - Redesigned their portable sports floor product and manufacturing process resulting in reduced setup times, more flexible manufacturing and cost reduction
CI Team Projects

- **Ferche Millwork; “Molder Ready Rough Riders”**
  - Development of an inventory replenishment system that was the first step in a project to **reduce lead time** from 3 to 2 weeks

- **Smurfit Stone; “Kick Ash”**
  - Determination of clinker removal techniques and **root cause** resulting in substantial cost savings

- **Northern Contours; “Go WEST”**
  - **Created new** veneer room **process and layout** that reduced lead time by 80% and labor costs by 30%

- **Beaver Manufacturing; “Get R Done”**
  - Developed a new drawer box manufacturing process incorporating cellular manufacturing that reduced lead times from 2 weeks to 30 minutes and increased productivity by 30+%. 
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.