LEAN

Achieving Substantial Supply Chain Improvements in a Compressed Timeframe

N. David Campbell
CEO
Agenda

• Results
• Drivers
• LEAN Process at West Penn
• Concurrent Engineering
• Lessons Learned
• Q & A
Results

- 25% cycle time reduction
- 15% increase in throughput
- Increased on-time deliveries to customers
- More deterministic forecasting
- Significant Investment
- Return
  - 3 months to implement
  - Positive cash flow - month 2
  - Payback - 5 months
- National Recognition
Drivers

• Significant increase in business
• Product testing constraints dictated throughput
  – Surface speeds
  – Inspector Certifications
• Worked more hours, but overtime became onerous
• Staffing additional equipment - not an option in near-term
• Viewing us as a critical supplier, our customer introduced us to the LEAN process
• Preconceptions
  – Size
  – Resources
  – Time to Results
Achieving LEAN

- Leadership must come from the top
- Sustaining – not a one-time event
- We must be “Industry Leaders”
- Customer input is critical
- Practice “Excellence in Execution”
- CEO’s job – vision, marshal resources, and “clear the hurdles”
  - Capital
  - Personnel
  - The “Status Quo” is not good enough!
Lean, LEAN?

- LEAN Manufacturing is an enabler to accomplish fundamental change
- Implementation could be very complex and take years to accomplish
- Rapid Improvement is achievable
- Evaluate your objectives and use only most applicable techniques
- LEAN the tools employed
  - 10 pages not 100
Process Review

Bill Claire
Process Focus

• Understanding the process first is key to success
• Ensure the process is capable of meeting customer expectations
• Refine process using lean techniques
• Monitor on an on-going basis using Six Sigma
• Utilize Continuous Improvement to refine process further
6S

- 5S - Sort, Set, Shine, Standardize, Sustain
- Added “Safety” as a 6th S
- Initial effort initially stalled
- Changed approach with teams
  - Tracking of all action items
  - Ownership for results
  - Assigned dates
  - Management visibility and involvement for “Past Due”
- Significant improvement achieved
- Areas are now in sustain
- Positioned for further work on Lean
LEAN

- Teams established a goal to initially improve throughput
- Documented existing processes
- Measured and evaluated the timing of each step in the process, and overall process
- Prioritized opportunities for improvement
  - Material handling
  - Test prioritization
  - Calibrations
  - Scan time
LEAN (Continued)

• Material flow evaluated and addressed first
• Current material work and prioritization flow defined
• Production baseline established for “Standard Parts”
• Standard Work timings established
• NVAW evaluated
• Redesigned as a Flow process
  – Limited facility redesign required
  – Benefit across all workstations
  – Easily modify based on empirical results
• Kanban used to control material flow – Pull process
• Established process improvement teams for:
  – Calibrations
  – Scan time
## Process Times

<table>
<thead>
<tr>
<th>Process Description</th>
<th>Average Time</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order to Move Part to Tank</td>
<td>20:13</td>
<td>13</td>
<td>35</td>
</tr>
<tr>
<td>Center/adjust part in fixture - review required specifications, place on desk, including part diagram</td>
<td>4:18</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Calibrate (once daily activity)</td>
<td>21:02</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>Setup parameters for the part, gain and gate level</td>
<td>1:50</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Setup motion control for specific part tested</td>
<td>1:22</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Measure attenuation required and enter in scope - Scan Side 1: normal, +5, -3 degrees for every required surface</td>
<td>5:25</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Measure noise (grass check) in surfaces where required</td>
<td>5:56</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Release part from fixture</td>
<td>5:37</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Get crane to remove part</td>
<td>4:50</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Flip Part in fixture</td>
<td>5:16</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Adjust part position in fixture and fasten</td>
<td>4:48</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Measure noise (grass check) in surfaces where required - Accept or reject at completion or each scan, finish work order paperwork</td>
<td>4:12</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Get Crane to Package</td>
<td>12:30</td>
<td>9</td>
<td>20</td>
</tr>
</tbody>
</table>

**Elapsed Time**

- **Ranges**
  - 0:54:00 to 2:26:00
  - 3:32:00 to 10:21:00
Before

1) Parts Storage
2) In-Process Shipping Containers, Cleaning, Prioritization, Finished Product, Packaging, Held Material
3) Banding
Flow Process

1) Received Forgings
2) Inbound Forging Staging
3) Clean & Prep
4) "Pull" Areas A & B
5) Prep and Ship
6) Held Material
Productivity

Current Average 5.01 Hours per Normalized Part

Target of 5.0 Hours per Normalized Part

Reduction to 4.3 Hours
Scan Time Variability

- 28% less than the highest
- 35% less than the highest
- 34% less than the average; 45% less than the highest
Leveraging Results – Penetrant

- Define goals, objectives, assumptions
- Review and update procedures
- Review process steps; most important first
- Establish baseline times
- Determine which steps can be combined
- Discuss multiple floor layouts; best options
- Implement pilot
- Standardize
- Determine additional data requirements
- Continue to refine
Technology Implications

- Limited automation required
- Used visual Kanban’s - simple
- Automation follows process changes
- Enhanced and automated cross-organizational
  - Forecasting
  - Prioritization
  - Tracking
- Allow the changes to standardize before automating
  - Understand
  - Document
  - LEAN
  - Implement – Trial and Error
  - Automate
West Penn University

- Established program to LEAN the training process
- Training program Includes:
  - Defined timeline
  - Well defined checklist of activities
  - Train the trainer
  - Formalized evaluation process throughout program
  - Math, reading comprehension, writing, and computer skills assessment and development
  - Safety and equipment certification
  - Lean and Six Sigma
  - Classroom, laboratory, and practical
- Applicable to any location or process

Well Defined Plan Critical to Success
Concurrent Engineering

• Work with value chain early in design phase
• Team consists of Materials Engineers, Product Designers, Forgers, Testers, Machine Shops, and technology providers
• Early evaluation of entire process to provide finished forging
• Goals are:
  – to reduce product development cycle time by 50% over conventional methods
  – Lean the Supply Chain from the very beginning
Bottom Line

- LEAN can be implemented in any organization, in a compressed timeframe
- Change must be driven from the top
- Focus on most applicable techniques
- Accept the 90% solution
- Success is the result of addressing the entire value chain
- Technology is an enabler, not an end goal

A Bias Toward Action – Rather Than Paralysis by Analysis