Case Study 1:
Large Western Pine Mill
Case Study 1: Large Western Pine Sawmill

- 75 MMBF annual production (log scale)
- Clears, Shop, Boards, Dimension
- USFS timber valuation study
  - Lumber size statistics
  - Headrig results

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Average Measured Size ($\bar{X}$)</td>
<td>1.532 in.</td>
</tr>
<tr>
<td>Total Variation ($s_t$)</td>
<td>.044 in.</td>
</tr>
<tr>
<td>Between-Board Variation ($s_p$)</td>
<td>.036 in.</td>
</tr>
<tr>
<td>Within-Board Variation ($s_w$)</td>
<td>.025 in.</td>
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Case Study 1: Large Western Pine Sawmill

R Chart

Between-board variation is stable

UCL = 0.0644
Centerline = 0.0197
LCL = 0.0000

7 8 9 10 11 12 1 2 3 4
a.m. Time in Hours p.m.
Drift in process average

\[ UCL = 1.5378 \]

Centerline = 1.5008

\[ LCL = 1.4637 \]

Between-board variation is stable

\[ UCL = 0.0644 \]

Centerline = 0.0197

\[ LCL = 0.0000 \]

7 8 9 10 11 12 1 2 3 4
a.m. Time in Hours p.m.
## Case Study 1: Large Western Pine Sawmill

Statistics Before & After Corrective Action

<table>
<thead>
<tr>
<th></th>
<th>Before corrective action</th>
<th>After corrective action</th>
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<tbody>
<tr>
<td>Average measured size</td>
<td>1.532 in.</td>
<td>1.501 in.</td>
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<td>Total variation</td>
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Target Set Reduction

End View of Log

Sawkerf

Current target set

Oversizing
Target set (less o.s.)

Target set red. (ch. #1)

New target set (ch. #1)
Cast Study 1: Western Pine Sawmill

- Headrig—gradual lumber thickness increase throughout the 1st shift
- During 1st shift—cold hydraulic oil expanded as it warmed up, causing drift in linear position setworks
- Corrected within one week for less than $10K
- Cut total variation over 40%
- Recalculating target size—increased the mill’s overall recovery by 0.4%
0.4% annual log savings =

75 MMBF x 0.4% = ____ MMBF savings

Translate this into real dollars

300 MBF x $____/MBF log cost

What’s the payback period

$10K / $150K x 250 days = ____ days
Case Study 2: Medium-Size Softwood Dimension Mill
Case Study 2: Medium-Size Softwood Dimension Mill

Day-to-Day Gang Edger Total Variation ($s_t$)
Case Study 2: Medium-Size Softwood Dimension Mill

- Sawfiling problem with gang edger
- Reduced sawing variation & target sizes
- Improved lumber recovery
- Able to purchase logs
- Mill was going to close
- Saved 80 jobs!!!
Remember W. Edwards Deming?

The Chain Reaction of Quality

- Improve quality ➔ Costs decrease because of less rework, fewer mistakes, fewer delays, snags; better use of machine and materials ➔ Productivity improves
- Capture the market with better quality and lower price ➔ Stay in business ➔ Provide jobs and more jobs

—Deming, Out of the Crisis
Case Study 3: Medium-Size Hardwood Sawmill

- Improve process performance
- Sawing machine centers
  - Identify & locate problems
  - Improve sawing accuracy
- Increase lumber recovery
<table>
<thead>
<tr>
<th>Size control study</th>
<th>Circular saw headrig</th>
<th>Gang resaw (fixed saws)</th>
</tr>
</thead>
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<tr>
<td>Operator target size</td>
<td>1.125 in.</td>
<td>1.125 in.</td>
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<tr>
<td>Calculated target size</td>
<td>1.135 in.</td>
<td>1.080 in.</td>
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<tr>
<td>Ave. measured size</td>
<td>1.179 in.</td>
<td>1.130 in.</td>
</tr>
<tr>
<td>Total sawing var.</td>
<td>0.044 in.</td>
<td>0.010 in.</td>
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<tr>
<td>Between-piece var.</td>
<td>0.037 in.</td>
<td>0.004 in.</td>
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<tr>
<td>Within-piece var.</td>
<td>0.023 in.</td>
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Calculated Target Size
(1.135 in.)

Critical Minimum Size
(1.063 in.)

Average Measured Size
(1.179 in.)
Headrig 4/4 Oak Variation Range Graph

___ Critical Minimum Size (CMS)
___ Calculated Target Size
___ Average Measured Size
--- Piece Range
A Piece Average
Gang Edger 4/4 Oak Variation Range Graph

--- Critical Minimum Size (CMS)

--- Calculated Target Size

--- Average Measured Size

--- Piece Range

A Piece Average
One Point Out of Control

Upper Control = 1.2591 in.
Limit

Average Measured = 1.1785 in.
Size

Pretty Good Statistical Control
Headrig 4/4 Oak - Between Piece Control Chart

Good Statistical Control

Upper Control = 0.1401 in.
Limit

Average Between Piece = 0.0429 in.
Range

Lower Control = 0.0000 in.
# Headrig 4/4 Oak Specification Chart

<table>
<thead>
<tr>
<th>Upper Tolerance</th>
<th>Nominal Size</th>
<th>Lower Tolerance</th>
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<tbody>
<tr>
<td>1.298</td>
<td>1.127</td>
<td>1.063</td>
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<tr>
<td>1.290</td>
<td>1.119</td>
<td>1.055</td>
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*Upper Tolerance*:
- Out of Specification

*Nominal Size*:
- 1.178
- 1.162
- 1.154
- 1.151
- 1.143
- 1.135

*Lower Tolerance*:
- Out of Specification
## Gang Edger 4/4 Oak Specification Chart

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**In Specification**

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**Upper Tolerance**

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- 1.170
- 1.162
- 1.154
- 1.151
- 1.143
- 1.135

**Nominal Size**

- 1.27
- 1.219
- 1.216
- 1.213
- 1.210
- 1.203
- 1.197
- 1.194
- 1.187
- 1.184
- 1.179
- 1.171
- 1.163
- 1.155
- 1.152
- 1.144
- 1.136
- 1.128
- 1.120
- 1.112
- 1.104
- 1.096
- 1.088
- 1.080
- 1.072

**Lower Tolerance**

- 1.063
- 1.055
- 1.047
Case Study 3: Medium-Size Hardwood Sawmill

- **Headrig**
  - Good statistical control—**however**…
  - Does not accurately saw lumber
  - Setworks need to be replaced & tracks straightened
  - Adjust target size after repairs (improve recovery)

- **Gang edger**
  - In good repair
  - Accurately saws lumber
Case Study 3:
Medium-Size Hardwood Sawmill

- Mill replaced headrig carriage & tracks
  - Able to secure financing for upgrading the mill
  - Improved lumber recovery
  - Accurately sawn lumber
  - Fewer customer complaints about thick & thin lumber
Case Study Conclusions

What is the common ground for success?

- Results-driven—no elaborate company-wide activity-focused quality program was necessary for achieving measurable bottomline results
- In each case study
  - A problem was identified and a solution formulated
  - Appropriate corrective action was taken
  - Measurable results—the problem was solved!
  - Bottomline business performance improved
- Positive results were captured quickly
Results Driven Approach to Improving Quality & Productivity
Too often quality programs center on activities rather than results.

Quality programs are easily derailed when the focus is activity-centered.

Ends become confused with means—processes confused with outcomes.

Key to successful improvement is to focus on producing measurable results.

—Harvard Business Review
Many companies spend vast resources on a variety of activities with little improvement in quality, productivity, or business performance. Payoffs are meager at best. Eventually companies abandon potentially useful QC techniques because the focus is on activities, not producing bottomline results.

—Harvard Business Review
Results-driven efforts bypass lengthy preparations and aim at quick, measurable gains. Investment is less. Improvement goals are short term. Top management takes action because they lead directly toward improved results—not promises of someday hopeful gain.

—Harvard Business Review
Key Benefits of a Results-Driven Approach to Improvement

- Quality improvement tools are introduced only when needed
- Trial & error reveals what works
- Frequent reinforcement energizes the improvement process
- Management builds on previous successes
Start With One Project & Do Something!

1. Get top management commitment to solve one quality problem
2. Form an improvement team to solve the problem—who?
3. Use problem-solving methodology
4. Solve the problem—**Do Something**!
5. Report results & acknowledge the team
6. Disband the team
7. Build on success—next problem
Final Thoughts
An Important Definition

INSANITY—doing the same things the same way and expecting to see a difference.

—Roger Miliken
Final Thoughts

Sawmilling is a Complex Business

Sawmilling is all about doing the right thing most of the time—success is **ALL** in the details.

Of all the primary wood breakdown industries, sawmilling offers the greatest number of ways to convert logs into useable products.

In other words—sawmilling offers the greatest number of way to screw up
It takes commitment, time, money, and lots of energy to convert the promise of potential into power of performance.

It is not a question of can you afford to improve quality, but can you afford not too!
Final Thoughts

DO SOMETHING!

Just remember there are three kinds of people
...people who make things happen
...people who watch things happen
...people who wonder what happened