Applying QC Principles in Lumber Drying

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Famous Quotes Concerning Quality Control

To improve is to change: to be perfect is to change often.

Winston Churchill
• If you can’t measure it, you can’t manage it.  Peter Drucker

• We need to learn to measure what is important, not to treat what we can measure as important.  

• So let’s focus on some of the things that we can measure as related to drying and that are significant with regard to the productivity of the process or quality of the final product.
Applying QC Principles in Lumber Drying

Where to Focus?

- Process
- Product
Applying QC Principles in Lumber Drying

**Process Variables**
- Preparation of lumber for Drying
- Kiln Operation
- Physical condition of kiln

**Product Quality**
- Final MC
- Straightness
- Minimal checking
- Coloration
Preparation of Lumber for Drying

• Stacking
  • Stickers
    • Alignment
    • Missing
    • Placement
    • Other issues??
Process Variables

**Preparation of Lumber for Drying**
- Kiln Loading
  - Placement of packages
    - Alignment of bunks with stickers
    - Maintaining a chimney
    - Blocking openings through load
Preparation of Lumber for Drying – how to measure/monitor

• Regular inspections
• Set targets – don’t expect 100% conformance
• Determine % of conforming product
• Record and track results
• Control charts
• More formal QC programs i.e. FPInnovations
### Inspection Form - example

<table>
<thead>
<tr>
<th>Pakckage #</th>
<th>Length</th>
<th>Bunks</th>
<th>Stickers</th>
<th>Boards</th>
<th>Other Comments or Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Missing</td>
<td>Mis-aligned</td>
<td>Missing</td>
<td>Mis-aligned</td>
</tr>
</tbody>
</table>

- **Process Variables**
- **Charge No.** __________
- **Kiln No.** _______________
- **Date:** _______________
- **Inspection by:** ________________________
- **Material Dimension:** ____________________
- **Rows/bundle:** ___________
- **Bundle Width:** ________________
Process Variables

Control Chart - Missing Stickers

% of Missing Stickers

Day Shift
Night Shift

2-Jan 4-Jan 6-Jan 8-Jan 10-Jan 12-Jan 14-Jan 16-Jan 18-Jan 20-Jan 22-Jan 24-Jan 26-Jan 28-Jan 30-Jan
Process Variables

1.0 Stickering and Stacking
1.2.2 Pieces Placement (double or on edge)

- #1: 100.0
- #2: 100.0
- #3: 96.7
- #4: 92.0
- #5: 90.0
- #7: 71.6
- #8: 38.2

Average = 83.2

Mill Ranking

Your Mill
USDA – Forest Products Lab

• Inspection program called IMPROVE (?)
• Included checklists and scoring systems for performance in various areas related to drying.
Kiln Operation – how to measure/monitor
- DB temperature – accuracy, uniformity
  - Hardwood kiln +/- 1 to 2°
  - Softwood (dimension lumber) =/- 4 to 5°
**Kiln Operation** – how to measure/monitor

- **WB/RH** – accuracy, uniformity
- **Airflow** – level & uniformity
  - at low air flows +/- 50 fpm from average
  - at higher air flows +/- 100 fpm
Physical Condition of Kiln – how to measure/monitor

- Condition of baffles
- Condition of doors/gaskets
- Operation of vents (closing/opening fully)
- Leaks around kiln structure
- etc.
No. 1 Objective of Kiln Operator Should Be to:

Operate and maintain the kilns in a manner that every board is exposed to (as much as possible) the same drying conditions.

What did Henry Ford have to say:

“Quality means doing it right when no one is looking”
Product Quality

- Final MC
- Straightness
- Minimal checking
- Coloration
Final MC Monitoring

Statistics are good:
• Average
• Standard Deviation
  Average +/- 2xS.D. = 95%

• COV – coefficient of variation
  - standard deviation expressed as a percentage of average
  i.e. Average = 8.0% & SD = 1.0%
  COV = 1/8*100 = 12.5

Basic statistics work good on a "normal distribution"
Final MC Monitoring
- often in drying we are dealing with a “non-normal” or “skewed” distribution

Figure 18-2
Typical final moisture content distribution (skewed).
Product Quality

**Final MC Monitoring**
- look at % of material below specified final MC

![Cumulative Frequency Chart](image)
Product Quality

- Straightness
- Minimal checking
- Coloration
Product Quality

- Softwood mills can now track warp-related degrade and relate back to specific charges
Product Quality

• Tracking incidence of drying-related defects allows us then to use tools such as control charts to identify when the process is going out of control and action is required.

Control Chart - SPF Downgrade due to crook
“When people and organizations focus primarily on costs, costs tend to rise and quality declines over time.” W.E. Deming
Monitoring and measuring helps develop a better understanding of the process/product.

A better understanding helps you set realistic targets for each part of the operation.

Personnel tend to respond better when they know the targets and receive feedback on their performance.

“If one does not know to which port one is sailing no wind is favorable.” Lucious Annaeus Seneca
Thank You

Have no fear of perfection - you’ll never reach it.  

Salvador Dali