Ten Steps Toward Successful Drying

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Presented by:
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Step No. 1: Enabling the kiln operator to operate in a holistic manner
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Step No. 1: Enabling the kiln operator to operate in a holistic manner

**Approach**

1. Involving/informing kiln operator on developments in each of these areas.

2. Informing personnel in each of these areas of the impact that their actions have on drying.

3. Identifying key information that needs to be exchanged, i.e.
   - New cutting regions
   - Space constraints in green lumber storage
   - New customer
   - Etc.

4. Have kiln operator visit and meet with key customers to get better understanding of quality needs.
Benefits

1. Operator sees the whole picture and not just part of it.

2. Drying decisions are always about the “best” decisions based on all circumstances.

3. Operator needs to be able to predict the outcome and explain why it is so.

4. No surprises!
Step No. 2: Know your wood

Physical Characteristics

- Initial MC
- Density
- Species proportions
- Compression wood
1. Technologies available to assist such as species detectors, green MC measurements, density detectors.


3. Tracking material through drying process to evaluate impact of different characteristics on outcome i.e. grade outturn, final MC patterns.

4. Develop drying strategies for different wood types.
Benefits

1. More uniform kiln charges $\rightarrow$ final MC uniformity
   $\rightarrow$ higher avg. final MC
   $\rightarrow$ less degrade from over-drying

2. Every 1.0% increase in final MC decreases drying degrade losses by about 1% of lumber value
   - at current prices that represents about $4/\text{Mbf}$

3. Help determine if pre-sorting technology will provide a payback for your mill
Step No. 3: Choosing the right equipment for the job

Capabilities of Equipment

- Temperature limits
- Airflow characteristics
- Venting capacity
- Impact on drying rate
Step No. 3: Choosing the right equipment for the job

**Approach**

1. Existing Drying Operation:
   - Know the characteristics of each of your kilns in order to direct each charge to the most appropriate kiln

2. New Kiln Facilities
   - Let the material to be dried determine the equipment needs (and not just your budget constraints)
   - Schedules to be run and drying rates to be achieved will help you and the kiln supplier determine how to best engineer a solution that will work
Step No. 3: Choosing the right equipment for the job

Benefits

1. More predictable results
   - Drying times
   - Lumber quality
   - Productivity

2. No surplus capacity i.e. using all of the features you have paid for.
Step No. 4: Plastic strapping

Polyester Strapping Applied at Stacker

- High tension capacity
- Stretch capacity to maintain tension
- Recycling of material
- Numerous benefits
Step No. 4: Plastic strapping
Polyester Strapping

- Typical strap has 1600 lbs. breaking strength
- Elongation of up to 13%
- Strap cost about $0.30 - $0.45/Mbf

- Other costs
  - Equipment
    - Manual
    - Automated
  - Extra labour
Documented Benefits

1. Reductions in material loss and breakage in the yard (green & dry)
   - Lumber
   - Stickers

2. Improved efficiency of loaders (green and dry)

3. Reduced drying degrade due to:
   - Restraint
   - Better package quality

Step No. 4: Plastic strapping
Documented Benefits (contin.)

4. Potential to implement attached dunnage

5. Benefits at infeed to planer
   • Fewer severely warped pieces (less jam ups, better productivity)
Step No. 5: Kiln charge preparation
Step No. 5: Kiln charge preparation

Approach

1. Uniformity going in $\rightarrow\rightarrow$ uniformity coming out
   - Species
   - Dimensions
   - Resource
   - History

2. Know your load and you will be better prepared to:
   - Select the appropriate schedule
   - Estimate drying times and results
**Approach**

3. Neat, well constructed loads result in better kiln performance

- Improved airflow
- More uniform drying
Step No. 5: Kiln charge preparation

Benefits

1. More uniform drying → shorter drying time

i.e. 1% reduction in drying time would provide for 2 extra charges per year per kiln.
Step No. 6: Create a uniform drying environment

Uniformity – a common theme

Creating a uniform drying environment is the only way to take advantage of all the efforts to produce uniform loads.
**Approach**

1. Analyze current process
2. Compare results against expectations
3. Make necessary changes to equipment and/or procedures

**Step No. 6:** Create a uniform drying environment
Many tools available to help with analyzing the process performance

**Basic Kit for Kiln Evaluation**

- Two, 8-channel temperature data loggers: $600
- Thermocouple wire and sensors: $300
- Basic notebook computer for above: $500
- Airflow meter: $700
- Portable wet-bulb sensors: $200

**Total**: $2,300

*suppliers such as Dendrotik, ITM, Omega, Cole Parmer*

**Step No. 6**: Create a uniform drying environment
Step No. 6: Create a uniform drying environment

Approach

- DB Temperature variability +/- 5° F.
- WB Temperature variability +/- 5° F.
- Airflow +/- 10% of maximum

Can you describe your process performance?

If you can’t describe what you are doing as a process, you don’t know what you’re doing.

*W. Edwards Deming*
Step No. 6: Create a uniform drying environment

**Approach**

- Make necessary changes to equipment or procedures i.e.
  - Boosting heating capacity (i.e. adding coils, installing more tubes for direct-fired units)
  - Adding or reducing venting capacity
  - Adding more fans or baffles
Step No. 7: Develop standard operating procedures (SOPs) for all regular activities

**SOP Definition**

Written procedure prescribed for repetitive use as a practice, in accordance with agreed upon specifications aimed at obtaining a desired outcome.
Step No. 7: Develop standard operating procedures (SOPs)

Approach

Examples of activities which would benefit from a SOP:

• Evaluation of any activity including piling, kiln loading, etc.
• Hot checks in a kiln
• Follow-up MC checks in yard or planer mill
• Grade checks
• Kiln tune up
• Kiln shut-down procedures
Benefits of SOPs

- Minimize impact of human element (less judgment calls)
- Standardized procedures should be more efficient to conduct (once learned)
- Define procedure to desired level of detail/accuracy (not too much or too little)
- Make statistical analysis/comparisons more relevant
- Better consistency in results over time
Preparing SOPs

Many resources available for help with writing SOPs including:

• Software programs on how to write SOPs complete with templates

• QC programs such as Six Sigma incorporate SOP preparation as part of their system
Step No. 8: Develop a library of drying schedules

The effectiveness of a drying operation should be measured by how much the drying time varies rather than by how consistent it is.
Step No. 8: Develop a library of drying schedules

Approach

Start with basic drying schedules and fine tune but continually following the pattern:

1. Initial Schedule
2. Observe and Measure
3. Adjust
4. Observe and Measure
5. New Schedule for Library
Step No. 8: Develop a library of drying schedules

**Benefits**

- More consistent and predictable drying results
- Maximize productivity at kilns
Step No. 9: In-line moisture meter at the planer mill

In-line moisture meters offer the only way to get complete and accurate information on the final MC of the material you have dried.

If you don’t measure it, you can’t manage it.
Step No. 9: In-line moisture meter at the planer mill
Step No. 9: In-line moisture meter at the planer mill

Benefits

- QC benefits for supplying consistent and known product to customers

- Opportunities to refine drying operations
  (enables the adjust → Observe and measure → adjust .......)
Step No. 10: Warp and grade analysis at the planer mill

Automated grading systems are capable of collecting and providing detailed information on warp which is the primary drying degrade factor for softwoods.

Now you can measure it, so why not start to manage it?
Step No. 10: Warp and grade analysis at the planer mill

Automated Grading

- Linear and transverse systems
- System outputs grade information but also possible to get detailed information on amount of warp.

Photo from Comact website
We used to refer to drying degrade as the “Hidden Cost of Drying”
Warp is a real cost of drying.

<table>
<thead>
<tr>
<th>Mill # / Species</th>
<th>Value Losses (%)</th>
<th>Value Losses ($/Mbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Spruce</td>
<td>9.3%</td>
<td>$37.20</td>
</tr>
<tr>
<td>1 – Pine</td>
<td>7.5%</td>
<td>$30.00</td>
</tr>
<tr>
<td>2 – Spruce</td>
<td>6.2%</td>
<td>$24.80</td>
</tr>
<tr>
<td>3 – Spruce-Pine</td>
<td>2.8%</td>
<td>$11.20</td>
</tr>
<tr>
<td>4 – Pine</td>
<td>0.9%</td>
<td>$3.60</td>
</tr>
<tr>
<td>5 – Spruce</td>
<td>2.3%</td>
<td>$9.20</td>
</tr>
</tbody>
</table>
With detailed information on type and amount of warp we can start to look at measures on how to reduce it and then measure the impact of those changes.

**Step No. 10:** Warp and grade analysis at the planer mill
Example of Benefits

Automated grading systems provide opportunity to compare actual measured warp against critical values for lumber grade.

Figure 18-9
Actual warp (crook and twist) allowances based on NLGA grading rules for softwood dimension lumber.

Step No. 10: Warp and grade analysis at the planer mill
Example of Benefits

1. You determine you are losing $225 ($1.50/Mbf) on every load (3 kilns) due to extra warp from poorly piled lumber (problems at stacker)
2. Repairs to stacker will cost $50,000
3. ROI on repairs $\rightarrow \approx 3$months

FPInnovations study by Jean McDonald
“Assessment of Automated Grading Systems for Softwood Lumber”
Concluding Remarks

- As mentioned in several of the steps, success in drying is a result of applying a consistent methodical approach.

- Data/information are great but only if we use them wisely.

Innovation comes from the producer – NOT from the customer.

W. Edwards Deming
Thank You
for your
Attention & Participation

Questions?
Or contact me anytime at:
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