THE SCS IN-KILN MOISTURE METER
For
NEKDA

John Wallace

(Proprietary and Confidential)
AGENDA

• SCS Forest Products

• SCS In-kiln Moisture Meter
  • Components
  • Benefits
  • Establishing the correlation between MC and Capacitance
  • Payback

• ProTrac: Tracking MC from the Kilns to the Planer
### SCS FOREST PRODUCTS

#### BACKGROUND

- Founded 15 years ago
- End-to-end moisture measurement product solution (sawmill, kiln, planer mill)
- Offices in US & Canada
- Customers:
  - 150 kiln systems
  - 140 planer mill
  - 100 sawmill systems

#### SAMPLE CUSTOMERS

- Weyerhaeuser
- CANFOR
- Georgia-Pacific
- West Fraser Timber Co. Ltd

#### SAMPLE PARTNERS

- USNR
- FPI Innovations
- FORINTEK
**PRODUCT LINE**

<table>
<thead>
<tr>
<th>INTEGRATION</th>
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</thead>
<tbody>
<tr>
<td>Transverse Sawmill Meter</td>
</tr>
<tr>
<td>In-Kiln Moisture Meter</td>
</tr>
<tr>
<td>Transverse Planer Meter</td>
</tr>
<tr>
<td>In-Line Planer Meter</td>
</tr>
<tr>
<td>Mc Pro 1500</td>
</tr>
<tr>
<td>Mc Pro 2000</td>
</tr>
<tr>
<td>Mc Pro 2400</td>
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<td>Mc Pro 2500</td>
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</tbody>
</table>

**ENGINEERING**

- Transverse Sawmill Meter
- In-Kiln Moisture Meter
- Transverse Planer Meter
- In-Line Planer Meter

**SERVICE**
OPTIONS FOR TERMINATING DRYING

Time-based schedules:
Kiln follows a schedule/recipe for set amount of time and shuts down at a variable moisture content

TDAL
Kiln follows a schedule/recipe for a variable amount of time and shuts down when a predetermined temperature drop across the load is achieved

Weight /Strain Gauge
Kiln follows a schedule/recipe for a variable amount of time and shuts down when a predetermined weight loss or strain is achieved

In-kiln Moisture Meter
Kiln follows a schedule/recipe for a variable amount of time and shuts down when a predetermined weight loss or strain is achieved
IN-KILN MOISTURE METER

**MC PRO 2000**

- Automatically measures the moisture content of the lumber as it dries and reports it to the kiln controller.
- Uses capacitance measurements to calculate moisture content.
- Each measuring point uses two metal plates inserted into the lumber package.
- Enables the kiln controller to determine the optimum time to shut down the kiln.
## FEATURES AND BENEFITS

<table>
<thead>
<tr>
<th>Product Feature</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>No electronics in or near the kiln</td>
<td>Eliminate the costly problem of meter failures due to exposure to environment.</td>
</tr>
<tr>
<td>Off the shelf hardware</td>
<td>No longer held hostage by a vendor. Can order parts directly from any local distributor.</td>
</tr>
<tr>
<td>Open architecture software; off the shelf operating system</td>
<td>Easily integrate to existing systems. Training is quick and easy.</td>
</tr>
<tr>
<td>Simple conduit runs</td>
<td>Reduce costly kiln downtime to ½ day for installation and commissioning. No hanging arrays in the kiln that are subject to mechanical failure.</td>
</tr>
<tr>
<td>Proven accuracy</td>
<td>Confidently eliminate costly hot checks.</td>
</tr>
</tbody>
</table>
IN-KILN MOISTURE METER
MC PRO 2000

DRAWING OF KILN INSTALLATION

1 Measuring Point
2 Conduit Run
3 USB Box
4 Computer
MEASURING POINTS AND PLATE CONNECTORS

- Stainless steel plates are inserted between tiers of lumber
- Stainless steel cables connect to the plates from the junction box using clips. The only wear items for the entire system are the clips, plates and stainless steel cables.
- No electronics located out at the kiln.
IN-KILN MOISTURE METER
MC PRO 2000

ELECTRICAL COMPONENTS

- Standard conduit runs inside and outside of the kiln to connect to relay boxes
- Conduit can be sleeved or threaded depending on the mill’s choice.
- Coaxial cable is 0.22”, Teflon-coated with temperature ratings from -70°C to +200°C
ESTABLISHING A CORRELATION BETWEEN THE MC PRO 2000 AND THE IN-LINE PLANER METER OR HANDHELD MOISTURE METER: COLLECT DATA

<table>
<thead>
<tr>
<th>Date/time the charge exited the kiln</th>
<th>Charge #</th>
<th>Kiln #</th>
<th>Dimension</th>
<th>Species</th>
<th>Desired MC% (at the planer)</th>
<th>MC Pro 2000 MC% at kiln shutdown</th>
<th>Hotcheck MC% results</th>
<th>Planer MC% results</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/02/2007 4:30am</td>
<td>1001</td>
<td>1</td>
<td>2x4</td>
<td>SPF</td>
<td>15.0%</td>
<td>15.0%</td>
<td>17.2%</td>
<td>14.0%</td>
</tr>
</tbody>
</table>
IN-KILN MOISTURE METER
FITTING THE MODEL

ESTABLISHING A CORRELATION BETWEEN THE MC PRO 2000 AND THE IN-LINE PLANER METER OR HANDHELD MOISTURE METER: FIT BEST MODEL
IN-KILN MOISTURE METER PAYBACK

MOST MILLS REALIZE PAYBACK IN 4-6 MONTHS

**Areas of Benefit**
- Productivity
- Moisture Grade Improvement
- Energy Savings
- Safety

**Typical Savings**
- Productivity: 5-15%
- Moisture Grade Improvement: 1-3%
- Energy Savings: (Depends on mill)
- Safety: (Depends on mill)
AVERAGE PRODUCTIVITY IMPROVEMENT IS 10%

Reducing Energy Costs and Increasing Productivity: Average Drying Time Reduced by 11%

- Manual shutdown: Average Drying Time = 30.1 hrs
- Signature: Average Drying Time = 26.7 hrs
## IN-KILN MOISTURE METER PAYBACK

**ADDING UP THE PRODUCTIVITY SAVINGS**

### Reduced Drying Time

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Current drying time</td>
<td>38</td>
</tr>
<tr>
<td>Drying hours per year</td>
<td>7040</td>
</tr>
<tr>
<td>Charges per year</td>
<td>185</td>
</tr>
<tr>
<td>New drying time (10% improvement)</td>
<td>34</td>
</tr>
<tr>
<td>Charges per year (10% improvement)</td>
<td>206</td>
</tr>
<tr>
<td>Additional charges per year</td>
<td>21</td>
</tr>
<tr>
<td>Value added (profit per 1000 fbm)</td>
<td>20</td>
</tr>
</tbody>
</table>

### Reduced Energy Costs

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Energy cost ($ per cubic foot)</td>
<td>0.01</td>
</tr>
<tr>
<td>Energy usage per hr (12MMBTU)</td>
<td>4,341</td>
</tr>
<tr>
<td>Reduced charge time (hrs)</td>
<td>3.8</td>
</tr>
<tr>
<td>Energy Savings ($ per charge)</td>
<td>150</td>
</tr>
<tr>
<td>Energy Savings ($ per year)</td>
<td>27,705</td>
</tr>
</tbody>
</table>

### Productivity Value: $127,245

*Data is from a real mill*

*Assumptions:*
- One kiln with 237 Mfbm capacity
- Average drying time of 38 hrs
- Natural gas price of $0.01/cubic foot
IN-KILN MOISTURE METER PAYBACK

AVERAGE GRADE IMPROVEMENT 1-2%

Charge 1: Using hand-held moisture meter to estimate moisture content, the charge is pulled and shows exactly 15% at the planer mill. This is a perfectly executed scenario.
Charge 2: Using hand-held moisture meter to estimate moisture content, the charge is over-dried and shows an average of 13% at the planer mill.
IN-KILN MOISTURE METER PAYBACK

AVERAGE GRADE IMPROVEMENT IS 1-2% CON’T

Charge 3: Using hand-helds to estimate moisture content, the charge is actually too wet and shows an average of 17% at the planer mill.
AVERAGE GRADE IMPROVEMENT IS 1-2% CON’T

The aggregate distribution of the three previous charges are plotted. Missing the target on the three charges can result in a wider standard deviation, leading to grade loss.

- MC Pro 2000 dramatically reduces the aggregate distribution of moisture content
- 1% improvement over hand-held methods.
IN-KILN MOISTURE METER
PAYBACK- IMPACT OF MEASUREMENT ERROR

MOISTURE GRADE IMPROVEMENT SAVINGS ARE SIGNIFICANT

<table>
<thead>
<tr>
<th></th>
<th>MC PRO 2000</th>
<th>HOT CHECKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(shutting down at target MC%)</td>
<td>(missing target by 1%)</td>
<td></td>
</tr>
<tr>
<td>MC (%)</td>
<td>STD DEV(%)</td>
<td>MC (%)</td>
</tr>
<tr>
<td>15.00</td>
<td>3.00</td>
<td>16.00</td>
</tr>
</tbody>
</table>

% BOARDS BETWEEN 10% AND 19%

<table>
<thead>
<tr>
<th></th>
<th>Hotcheck</th>
<th>SmartTrac-MMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>% BOARDS &gt; 19%</td>
<td>8%</td>
<td>13%</td>
</tr>
</tbody>
</table>

COST OF MISSING MC TARGET

ADDITIONAL 5% OF PRODUCTION NOW DOWNGRADED WET

Note: if standard deviation slips to 3.3% due to missed targets, then difference = 7%
Performance data of a kiln using *MC Pro 2000*:

- Number of 2”x6” kiln charges shutdown by MC Pro 2000 in this kiln study = 76 (1.72 million boards)

- Desired MC at Planer Mill = 15%

- Actual Ave MC at Planer Mill = 15.3%

- Typical over-dry lumber (under 10% MC) = 3.6%

- Typical under-dry lumber (over 19% MC) = 1.4%

- Typical lumber yield (10% to 19% MC) = 95%
QUANTIFYING THE BENEFITS:

**Grade**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Net Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primes</td>
<td>1.0%</td>
</tr>
<tr>
<td>#2</td>
<td>0.55%</td>
</tr>
<tr>
<td>Low Grades</td>
<td>-1.95%</td>
</tr>
<tr>
<td>Trim Loss</td>
<td>-0.35%</td>
</tr>
</tbody>
</table>

**Percentage Change (%):**
- J Grade: -1
- Sq Edge: -0.5
- #2: 0
- Std: 0.5
- #3: 1
- Util: 1.5
- Sel St: 2
- Econ: 2.5
- Stud: 3
- Trim: 4

**Grade Recovery Value**: $719,200

**Assumptions**
- Annual Production: 400,000,000
- Prime Grade Premium: $80
- #2 Differential: $1
- Low Grade Differential: $(50)
- Trim loss Differential: $(5)

**Prime Cash Value**: $320,000
**#2 Cash Value**: $2,200
**Low Grades Cash Value**: $390,000
**Trim Loss Cash Value**: $7,000

**Grade Net Benefit**
- Primes 1.0%
- #2 0.55%
- Low Grades -1.95%
- Trim Loss -0.35%

**Prime Cash Value**: $320,000
**#2 Cash Value**: $2,200
**Low Grades Cash Value**: $390,000
**Trim Loss Cash Value**: $7,000

**Grade Recovery Value**: $719,200
IN-KILN MOISTURE METER PAYBACK

AVERAGE CUSTOMER PAYBACK IS 4-6 MONTHS

Calculation:

Productivity improvement of 10%  $127,245
Moisture content/grade improvements of 4%  $87,690
Less value to allow for natural defects  (30-40%)

3-4mo Payback

Note: Real data from a mill
PROTRAC: INTEGRATED REPORTING

PROTRAC:

- Integrates Kiln & Planer moisture meters
- Reports can be viewed by anyone that is connected to the network.
- Initial focus of reports is to increase the speed that data is shared between the planer and kiln operators. Why? Reduce the time it takes to recognize a problem so that adjustments can be made and less lower grade wood is produced.
- Transparency will increase as all users view the same data.
CONTACT INFORMATION

Thank You!

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