An Analysis of Processing Head Measurements in Merchandizing Southern Yellow Pine

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Tree Merchandizing

Loggers motivation:
1. Market demand
2. Higher economic value (total stem value)
Merchandizing with Knuckleboom Loader

- Visual estimation
- Subjective
- Potential measurement error
Merchandizing with Processing Head

- Eliminate operator subjectivity
- Measure the actual length and diameter of tree

https://waratah.com/
Processing Head

HTH622B Harvester Head

- Length measuring wheel
- Diameter measuring arms
- Feeding wheels
- Saws

Specifications:
- 2280 kg / 5,027 lb. Net Weight
- 32 MPa / 4,641 psi Max Hydraulic Pressure
- 650 mm / 26 in. Max Delimb Opening
- 730 mm / 29 in. Max Feed Roller Opening
- 750 mm / 29.5 in. Max Sawing Capacity
- 24-30 metric ton Carrier Size

https://waratah.com/
Processing Head

https://www.tigercat.com/product/h250d-processor/
Processing Head
Previous study: Total Stem Value Comparisons Between Tracked Processor & Knuckle-boom Loader

- 2154G John Deere Swing Machine
  - 622B Waratah processing attachment head
- 234B Tigercat knuckleboom loader
  - Pull-through de-limber
  - Slasher saw
- Same tree was “merchandized” by each machine
Using a processing head did not increase logger’s total merchantability on a per/stem basis.

Visual estimation may result in inaccurate measurements.

If calibrated correctly, utilizing a processing head could ensure accuracy.

If mills pursue accuracy requirements, processors will need to be reconsidered in the Southeast US.
Merchandizing with Processing Head

- Problem: confirmation of its measurement accuracy
- Potential error sources:
  - multiple passes due to limb removal
  - The head does not return to the butt after grabbing the stem
  - Measuring wheel skips over the knots and limbs
Study Locations

Figure 1. Study Locations
Methods

- 4 sets, each 25 logs (100 logs in an operation)
- Record the log measurements by the processing head (length and diameter)
- Measure the processed log (length and diameter inside-bark)
- Analyze the measurement differences
Preliminary Results
Figure 2. Data Distribution of Differences in Butt Diameter Measurement
Figure 3. Data Distribution of Differences in Top Diameter Measurement
Length Measurement Differences Distribution

Figure 4. Data Distribution of Differences in Length Measurement
<table>
<thead>
<tr>
<th>Logger</th>
<th>Butt Diameter (cm)</th>
<th>Top Diameter (cm)</th>
<th>Length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>A</td>
<td>2.87</td>
<td>2.19</td>
<td>3.79</td>
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<tr>
<td>B</td>
<td>1.04</td>
<td>2.35</td>
<td>1.19</td>
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<tr>
<td>C</td>
<td>-3.87</td>
<td>4.81</td>
<td>0.56</td>
</tr>
</tbody>
</table>

Table 1. Summary of Measurement Differences between Processing Head Measurement and Post-measurements
Source of measurement differences

- The operators’ experience
- Calibration
- Post measurements error (difficulties to measure the log’s diameter)
Figure 5. Field Documentation
Next …

- Data collection in 5-7 operations in the Southeast US
- Re-visit the previous operations (Software update by Waratah)
Questions?