Automated structural log segregation in harvesting operations

Wood quality – why bother?
High stiffness logs are worth more than low stiffness logs

Figure 3. Relationship between breakaway variance quality log prices and on-site average log acoustic velocity for seven Douglas-fir study sites.
LVL Veneer Value using Sonics

Douglas fir Pacific NW trials – two operational scale trials sorted the log infeed at a 13,000ft/sec threshold.

Results - Increased Yield of high stiffness D fir LVL Veneer:
- Trial 1. 62% G1&G2 compared against 47% from unsorted logs
- Trial 2. 60% G1&G2 compared against 45% from unsorted logs

Alberta Lodgepole pine trial results
- (0.1km) 328ft/sec improvement in sonic velocity is worth US$16/m³ on log volume
- US$3.8m for a 300,000 t mill (at US$250/m³ for G1 veneer)

Sonic technology – what is it?

Logs are typically made and sold based on visual grading
Speed of sound provides a direct measure of structural properties

\[ \text{MOE (stiffness)} = \text{density} \times \text{sonic velocity}^2 \]

Hitman sonic technology enables stiffness to be measured in harsh forestry and wood processing environments – current tools
Trial results

- Hitman PH330 equates to Hitman ST300 hand tool measures

![PH vs ST Velocities - trial result](chart1)

\[ y = 0.97x + 0.20 \]

\( R^2 = 0.87 \)

Performance ... example 1

- 50-70 year old Douglas fir stands
- Predicted PH selection, based on ST300 velocity on butt log

![Effectiveness of PH selection vs HM selection](chart2)

\[ y = 1.0245x + 3153.4 \]

\( R^2 = 0.4647 \)
Performance ... example 1

- 50-70 year old Douglas fir stands
- Relative gain in mean velocity from ST (PH) is 70% - 80% of HM

![Graph showing Potential Processor Head selection - Douglas fir (439 trees/logs in Sthn Oregon plots/sites)]

Performance ... example 2

- Large dataset - radiata pine with HM average 10,000 ft/sec
- ‘PH’ delivers 80% relative gain (vs theoretical maximum)

![Graph showing Processor Head segregation - Radiata Pine (HM > 8,200 across range of sites)]
New Hitman PH330 – Dangle head tool

Prototype Hitman PH330 unit on Waratah 626 in NZ

Mechanical Integration – large head
Prototype Hitman PH330 unit on Waratah 626 in NZ
UK Prototype on smaller Ponsse head

Mechanical Integration
Prototype unit on Ponsse H73e in UK
Mechanical Integration
Hitman PH330 probes on Waratah 626

Mechanical Integration
Hitman PH330 electronics and hydraulics
Hitman PH330 - Operation

1. Dangle head clamps tree or stem
2. Operator activates saw
3. Hydraulics insert probes
4. Saw cut finishes
5. Velocity measured
6. Probes retracted
7. Velocity, Grade, and audible output indicated in cab
8. Operator confirms log making decision for next log to be cut
9. Head moves to next cut position and repeats process
10. Data stored for later download
Hitman PH330 probe imprint on log

Hitman PH330 operational trial
Summary

- Processor head sonics measure stiffness before log making
- Value captured from correct length and segregation decisions
- Retrofit available on common head types
- Supply through lease to contractor
- Applicable to sawlogs and LVL across species
- Operational deployment from 2011