Winch-Assist Technology for Steep Slope Harvesting

Timber Measurement Society
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Outline

- Why winch assist
- Equipment systems
- Future direction
Why winch assist?
3 key reasons

Safety

Available fibre

Adaptability
# Safety

<table>
<thead>
<tr>
<th></th>
<th>Manual Tree Falling &amp; Bucking</th>
<th>Mechanized Tree Falling</th>
<th>Forestry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Years</td>
<td>490</td>
<td>483</td>
<td>16,215</td>
</tr>
<tr>
<td>Injury Rate %</td>
<td>26.8</td>
<td>1.9</td>
<td>5.2</td>
</tr>
<tr>
<td>Serious Injury Rate* %</td>
<td>8.4</td>
<td>0.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Claims paid $million</td>
<td>9.3</td>
<td>0.4</td>
<td>44.3</td>
</tr>
</tbody>
</table>

* >30 days off

Source: WorkSafeBC
### Available Steep Slope Fibre

#### BC Timber Volume by Slope Class

<table>
<thead>
<tr>
<th></th>
<th>Total AAC(^1) (million m(^3))</th>
<th>AAC &gt; 35% (million m(^3))</th>
<th>AAC &gt; 35% (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coast</td>
<td>18.1</td>
<td>10.1</td>
<td>56%</td>
</tr>
<tr>
<td>Interior</td>
<td>58.9</td>
<td>8.2</td>
<td>14%</td>
</tr>
</tbody>
</table>

\(^1\) Annual allowable cut
Adaptability

- Options for competitiveness
  - Cut and pile for yarding
  - Cut and shovel-log
  - Versatile terrain capabilities
  - Safe and content workers
  - Improve overall performance
  - Increase overall productivity

Source: Dale Ewers
Winch-Assist Machines: Europe

- Cable assisted forwarding started in late 80’s
- Expanded to harvesters in 2000’s
- Range in complexity and sophistication
- 800+ commercial units in use
Ponsse with Herzog Winch

- Operating in Oregon
John Deere Haas Winch

- Operating near Kamloops B.C
- FPInnovations assessing this system
Anchor point is a stump
Major European Winch Manufacturers Include:

- Haas
- Herzog
- Komatsu
- Ecoforst
New Zealand Developed Technology

- Felling machine is tethered to an anchor machine
Winch Equipped Anchor Machines

Excavator

Dozer
FFE Excavator Mounted
Remote Operated Bulldozer
ClimbMax
North American Technology
Summit Winch-Assist in Washington

- Anchor machine - winch system
- Single cable
- Summit’s 3rd design, 7th unit built
- Several units using hot saws
- Bucket is chained to carriage, not dug in
- Observed with Hot Saw
T-Mar LC150 “Rhino”

- Easily accessible emergency stop (radio).
- Load cell monitors and records cable tension
- Twin anchors
- Fail safe spring brake in mechanical/hydraulic failure
- 3 camera feedback
Tracked

Higher cable tensions
Lower stability/traction
More available/serviceable
Wheeled

Lower cable tensions
Better stability/traction
Less site degradation
Felling Heads

- **Hotsaw**
  - Good in understory
  - Good with small diameter stems
- **Directional**
  - Good uphill and downhill
  - Capable of hoe-chucking
  - Longer reach
Winch assist ready

Major manufacturers are making these now with:

• Front escape hatches,
• 4 point seat belts,
• Engineered attachment points
• Engines designed for steep operation, reservoirs, tanks
• Longer track frames for stability
Winch-Assist Wave Hitting BC Steep Slopes

- 44 machines purchased or planned in BC

<table>
<thead>
<tr>
<th>Winch Machines</th>
<th>BC Current</th>
<th>BC Planned</th>
<th>US Current</th>
<th>US Planned</th>
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</thead>
<tbody>
<tr>
<td>Climbmax</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ROB</td>
<td>4</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Haas</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HSM</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Herzog/Alpine</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EMS</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Summit</td>
<td>1</td>
<td>9</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>T-Mar</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>FFE</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>T-Winch</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>28</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

PNWBC
Development Needed

This concept is still under rapid development, operating limits are yet to be defined
- Slope, soil, machine type – stability and traction
- Cable wear and integrity
- Anchoring
- Operator learning

Working methods
- Safe Work Procedures
- Operator and contractor training

Engineering planning and layout
- More options to consider
- Road and landing design
FPINNOVATIONS’ STEEP SLOPE INITIATIVE

GOALS

• Reduce accidents by 50%
• Increase margins by $5/m³
• Increase access to economically available timber by 2 million m³/yr.
• Mitigate environmental impacts

http://steepslopeinitiative.fpinnovations.ca/
Summary

- Winch-assist works.
- Safety and cost-reduction benefits.
- Some adaption to BC conditions required.
Thank you

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Steep Slopes

- Safety! High accident rate with manual falling
- Skilled labour shortage
- Changing harvest profile (MPB)
- Fibre supply shortfall
- Expensive timber
- High investment in new gear
- Environmental impacts
Concepts - What is Best?

- Integrated winch or anchor machine?
- 1 or 2 cables?
- Tracked or Wheeled?
- Dozer or excavator?
- Felling head?
- Sophisticated or simple?
- What kind of safety systems?
Winch-Assist Revolution

- Summit
- Rhino
- EMS Tractionline
- ROB
- ClimbMax
- Herzog-Alpine
- Haas
- HSM
Play Video
EMS Tractionline

- **EMS anchor machine with JD 909 FB**
- **EMS with Tigercat, WA**

> • Reverse Bucket mounting allows for swivelling sheave block and improved ground engagement in hard ground
FFE Anchor machine screen in buncher
Haas Winch-Assist
Alpine/Herzog Winch on Ponsse

- Operating in Oregon
Alpine/Herzog Winch
HSM

- Felling head/clam-bunk skidder
- Long logs.
Summit Winch-Assist

- Adding twin drums
LC150 Remote Winch Assist

- 100% Remotely Operated
  - No Person On the Machine
- High 3’ Clearance
- 1500’ of 1” Swaged Line
- Independent Guyline & Anchor Blade
- Very Stable
- Primary Communication Through Cable Tension
- Can Be Used With Multiple Machines
Anchoring