Case Study of the Active 70 Cable Yarder in New Zealand

Thornton Campbell - Masters Student

Supervisors
Associate Professor Rien Visser
Doctor Hunter Harrill

University of Canterbury School of Forestry
New Zealand
Commercial Forestry in NZ

- Exclusively monoculture plantation
- Harvest age 28
- Clear cut, size unlimited
- Whole tree extraction dominant
- Stocking 350 – 650 stems/ha
- Standard volume of 650 tons/ha

- Cable yarder use increasing significantly
  15% in 1976 to 40% in 2014
- Average harvest costs
  $26.90/t ground based, $35.90/t yarder based
Cable yarding in New Zealand

- Typical machinery
  - Pacific Northwest origins or modified versions
  - Generally from the 1970-1980’s

- Large heavy machinery
  - 45 - 70 tons
  - 300 - 450kw

- Modern adaption of these machines common
  - Limited difference from base models
  - Often necessary repairs not upgrades
Generally working fine – however

- To be competitive internationally our systems need to continue to adapt and advance.

- Forest areas exist that are uneconomic to harvest. New methods might resolve this issue.

- Increase safety of workers, ideally without reducing productivity

Solution – Adoption of new systems and technology.
New machinery on the scene

- Domestic and international options

  Active 70 yarder
  (Rotorua, NZ)
  By Active Machinery LTD

  Koller 602H
  (Kufstein, Austria)
  By Koller Forsttechnik
<table>
<thead>
<tr>
<th>Features</th>
<th>Active</th>
<th>Koller</th>
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<tbody>
<tr>
<td>Skyline and mainline tension and distance monitoring</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Modern turbo diesel engine</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Automated carriage control</td>
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<td>+</td>
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<td>Full remote control operation</td>
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<td>+</td>
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<td>Real time display of GPS tracking of choker-setters</td>
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<td>Highly simplified, ergonomic drivers cab</td>
<td>+</td>
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<tr>
<td>Terrain tracking technology</td>
<td>+</td>
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GPS tracking - AcDat system

Yarder

Yarding corridor

Tailhold

Safe area

Alert zone
Study design

- Productivity assessment
  - Manual and GPS tracking time study
  - Haul volume estimates
- Assessment of choker setter work levels
  - Heart rate analysis
- Noise assessment.
  - Decibel meter
- Assessment of features
  - Observation and measurement.
Study data examples – Time study through GPS tracking
Study data examples - CHPS application
Productivity:

- 5 days, 175 cycles, 5 corridors
- Average piece size 1.1 t (0.3 – 2.0t)
- Extraction distance 140m (40 – 280m)
- Deflection

- Utilization rate 65%
- 15.3 t/SMH
- 24.3 t/PMH

- Overall difficult site: steep area → hard for choker-setters, low deflection → poor payload
Effect of Deflection

- Range between 2 – 8%
- Corridors with more deflection had larger turn volumes
  2.7 m$^3$/turn at 2% deflection
  4.6 m$^3$/turn at 7% deflection

This caused large differences in productivity between corridors
  13.3t/SMH at 2% deflection
  23.4t/SMH at 7% deflection
Heart rate monitoring

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<tr>
<th>Indices</th>
<th>Average</th>
<th>High work rate</th>
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<tr>
<td>Relative heart rate at work</td>
<td>31.5 %</td>
<td>&gt; 30%</td>
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<tr>
<td>50% of working heart rate</td>
<td>0.97</td>
<td>&gt; 1.00</td>
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<tr>
<td>Ratio of resting to active</td>
<td>1.56</td>
<td>&gt; 1.2</td>
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- Slight discrepancies in work level
- All indices indicate hard continuous work
- Indicates implications for fatigue related issues
Health and safety benefits

- Tension monitors
  - Assessment of working loads in difficult areas

- GPS worker tracking
  - Remove miscommunications, no line of sight issues

- Quiet engine
  - 10 meter radius volume below 80 Db
  - Minimal risk of hearing damage at a 10 meter distance

Definite improvement
Conclusion

Active 70 yarder productivity study complete

Koller 602 study still to come

New generation machines bring opportunities for the New Zealand forestry industry.