Machine utilisation using GPS tracking

A Pan Pac Case Study

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Forest Harvest is expected to increase to 35 million m³ by 2025.

New planting increased by 80,000 hectares in the 5 years following 1990.

Sources: National Exotic Forest Description, 2016 p5. & MPI 2016 - Wood Availability Forecasts (Scenario 3)
Safety

2013: Highest Number of forestry deaths
2014: Overhaul of Forestry industry
2015: Introduction of new Health and Safety at Work Act
2017: Number of Fatalities beginning to rise again

Forestry Industry Fatalities

“To provide traction assist for mechanised felling machines on steep slopes”
- Allows felling machine to operate on up to 45 to 50 degree slopes.

- Reduces soil disturbance (Important in steep terrain due to erosion).
Scope of the project

- Winch-assists have become increasingly common in forest operations: Both in NZ and around the world.

- Until now, there has been no in-depth or long term evaluation of winch-assist machines.

- Utilization rate is still an unknown.
Objectives

1. What is the current utilization rate for a Tractionline winch-assist machine?

2. What influences utilization rate?
   a. Can utilization of the winch-assist be improved?

Pan Pac’s expectation of winch-assist utilization is >75%
The importance of utilization

- Winch machine is paid on a day rate.

- If the machine is under utilized or not used at all, the cost to productivity ratio begins to increase significantly.

- An accurate estimate of utilization rate will allow for better planning and efficiency of the winch-assist system.
Methods – GPS Tracking

Using the units to collect machine “On” and “Off” times, to be used in the formula below.

\[ \text{Utilization (\%)} = \frac{PMH}{SMH} \times 100 \]
What I have found so far

There is a clear difference between how often the winch-assist has been used compared to the felling machine.

The winch-assist has been used on 49/70 possible days.

<table>
<thead>
<tr>
<th>Machine</th>
<th>Total hours “On”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winch-assist</td>
<td>268</td>
</tr>
<tr>
<td>Felling Machine (Only on days used with Winch)</td>
<td>357</td>
</tr>
<tr>
<td>Felling Machine (Total)</td>
<td>510</td>
</tr>
</tbody>
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That’s 21 Days not used!
- Utilization rate of the winch-assist is 75% when the two machines are used together.

- Utilization rate of the winch-assist as a proportion of total felling machine time is 53%

- When used, SMH for the winch-assist average 5.5 hours/day.
Other potential uses for GPS software

Forest level machine location.

Single machine movements – whole day.
Discussion

Limitations:

- GPS data captures the total hours a machine has been “On” and “Off”, but not able determine causes of delays.

Opportunities:

- Second felling machine to potentially be used with winch-assist.
- Effects results from delay study will have on PMH.
- Other potential uses for GPS tracking units.
What’s next?

- Continue with dissertation project.
- Provides a starting point/foundation for future research into winch-assist machines.
- Insight and feasibility for the use of GPS tracking in forest machinery.