ONBOARD COMPUTING IN FOREST MACHINERY -
A PERSPECTIVE FROM AUSTRALIA AND SOUTH AFRICA

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Introduction

- OBCs: Tool to collect performance information on forest operation
- Field of application:
  - Improved utilisation and productivity (understand bottlenecks)
  - Optimization of logistics and planning (Reduced fuel consumption)
  - Monitor soil disturbance and treated area
- Implementation on the machine (Long-term measurements)
Types of onboard computers

- Vibration sensor
- GPS
- Purpose-built
- Manufacturer design

Increased complexity. Increased possibilities.
Aim of the study

- Test the use of on-board devices in Australian and South African forest operations.
  - Australia:
    - Long-term studies on multiple machines to monitor system efficiency
    - Development of an onboard computer selection and implementation guide
  - South Africa:
    - Short-term studies on single machines to understand the accuracy and the potential use of detailed information
Australian trial sites locations

Range of:

• Forest types
• Harvest systems
• Onboard computer systems
Trial site A - Central Highlands

Background

- Victorian Central Highlands native forest logging (Eucalyptus)
- MultiDATs in harvester, skidder and one excavator (8 months)
- Garmin GPS in harvester and skidder

Results:

- Harvester & skidder underutilised (<55%)
- Excavator on landing well-utilised (>70%)
- Bottleneck on log landing
- Improvement of the log landing system
Trial site B - Green Triangle

Background

- South Australian Pinus radiata plantation
- Dasa 4 (www.dasa.se) in harvester and forwarder
- GPS in both machines

Results:

- Harvester utilisation >70%
- Forwarder - OBC: implementation problems
- GPS recording log locations - Transferred from harvester to forwarder (planning routes)
Trial site C - Albany

Background

- West Australian blue gum plantation
- **RouteHawks** ([www.strongeng.com](http://www.strongeng.com)) in feller-buncher, skidder and chipper
- **Multidat**s in 3 chippers (9 months)
  - Recording delay causes

Results:

- Chipper utilisation variable
  - Need more time to get good figures
- Major delay causes are (operator input):
  - Breakdowns
  - Waiting for trucks
South African trial site locations

Study site
- SITE A (Klujskraal)
- SITE B (Grabouw)
- SITE C (Singisi)
# Trial site characteristic

<table>
<thead>
<tr>
<th>Location</th>
<th>Site A (Kluijtjeskraal)</th>
<th>Site B (Grabouw)</th>
<th>Site C (Singisi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine type</td>
<td>Timberjack 380C + motor-manual processing at landing</td>
<td>Timberjack 380C + motor-manual processing at landing</td>
<td>Tigercat 625C + processor at landing</td>
</tr>
<tr>
<td>Species</td>
<td>Pinus radiata</td>
<td>Pinus pinaster</td>
<td>Pinus elliotti</td>
</tr>
<tr>
<td>Mean slope (%)</td>
<td>0</td>
<td>23</td>
<td>16</td>
</tr>
<tr>
<td>Soil moisture</td>
<td>Dry</td>
<td>Dry</td>
<td>Partially wet</td>
</tr>
<tr>
<td>N (number of cycles)</td>
<td>33</td>
<td>64</td>
<td>68</td>
</tr>
</tbody>
</table>
Methods

• Skidders were equipped with two different OBDs, **Fleet Manager Professional** ([www.mixtelematics.com](http://www.mixtelematics.com)) and **MultiDAT** ([www.feric.ca](http://www.feric.ca))

• Parallel, manual time studies using a Trimble palm device running dedicated time study software (WorkStudy+)

• Elaboration and comparison of the collected utilisation and GPS data using GIS software (Arc-GIS 9.3)
Results: GPS Data analysis

<table>
<thead>
<tr>
<th>source</th>
<th>Site</th>
<th>Driving</th>
<th>Choking</th>
<th>Dechoking</th>
<th>Inactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultiDAT</td>
<td>Site A % error</td>
<td>0.59</td>
<td>2.83</td>
<td>1.56</td>
<td>-4.29</td>
</tr>
<tr>
<td></td>
<td>Site B % error</td>
<td>-5.33</td>
<td>1.35</td>
<td>2.69</td>
<td>1.29</td>
</tr>
<tr>
<td></td>
<td>Site C % error</td>
<td>-1.74</td>
<td>2.05</td>
<td>4.40</td>
<td>-4.70</td>
</tr>
<tr>
<td>FleetManager</td>
<td>Site A % error</td>
<td>1.36</td>
<td>1.34</td>
<td>2.64</td>
<td>-5.34</td>
</tr>
<tr>
<td></td>
<td>Site B % error</td>
<td>-0.01</td>
<td>-4.33</td>
<td>1.15</td>
<td>3.19</td>
</tr>
</tbody>
</table>

Identified error sources:

• Definition of the speed threshold used to detect when the skidder is moving (choking/dechoking over-estimation)

• Length of the time interval used to detect when the machine was not working (inactivity under-estimation)

Possibility to use the data for other analysis (eg. Soil disturbance patterns)
• Vibration sensors can be used to measure machine utilization but needs the input of the operator to have a correct evaluation.

• Automated time study, using GPS-OBCs data worked quite well in evaluating the working time of skidders. Analyses are time-demanding.

• Potential benefits of new approaches in improving working process can be relevant (15% working time).

• Forestry organizations in some cases do not have the resources or expertise to resolve the issues that can arise from implementation of complex technologies (Dasa, RouteHawk eg.).

• Gradual introduction of OBCs on machinery can be successfully implemented in operations to provide data to review and improve machine performance.
THANK YOU FOR YOUR ATTENTION