Innovative safety systems for forest industry

PROXIMITY DETECTION AND WARNING SYSTEM ASSESSMENT IN A SAW MILL OPERATION

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Outline

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Background

- Safety management in busy worksites where rolling equipment and pedestrian could interfere (e.g. saw mill yards, infeed/outfeed areas, shipping areas) needs solutions
- Poor visibility and blind spots could be compensated using Proximity Detection and Alert Technologies (PDAT)
- PDAT is already used by other industries (e.g. construction, mining).
Objectives
Technology testing: the Hit-Not proximity detection system

- Assess the correlation between the calibrated distance and the actual triggered alert distance
- Assess how different types of obstacles affect alert distance
- false alarms rate and missed alarms rate
Methodology

- The Hit-Not system

Magnetic Field Generator (MFG)

Warning Zone

Danger Zone

Proximity Module

Personal Alarm Device (PAD)
Methodology: site and equipment

- Prince George Canfor’s sawmill
- Planner outfeed and shipping area (over 1000 m³/day)
- Busy space (4-5 active forklifts, rail cars, trucks.)
Methodology: approach and technics

- Static method
  - Preferred method by most studies conducted
  - Accurate measurements
  - Not real working conditions
Methodology: approach and tools cont.

- Dynamic method
  - Not much literature available
  - Real life operating conditions
  - Low accuracy, complex setting, large amount of data
Results: equipment & safe zones shape

- off-central and high location of the MFG affect distance
- PAD-to-vehicle distance depends on forklift and load’s shape
Results: static test - open area

Calibrated (7.93 m/3.96 m) and actual distances

- Warn measured
- Danger measured
- Warn set
- Danger set
Results: static test - open area cont.

Adjusted calibration: 8.8 m/4.9 m

- Blue line: Warn measured
- Red line: Danger measured
- Dashed blue line: Warn reset
- Dotted red line: Danger reset
Results: static test - open area cont.

Simulated distances based on recalibration vs. initial calibration

- Warn adjusted (model)
- Danger adjusted (model)
- Warn set
- Danger set
Results: static test – obstructed

Measured distances: open line vs. obstructed line
Results: static test – PAD vs. XL PAD

Personal Alarm Devices comparison

Distance (m)

Measurements

XL PAD Warn
XL PAD Danger
PAD Warn
PAD Danger
Results: dynamic test

- About 60,000 forklift points
- Over 1500 pedestrian points
- GIS analysis based on static test measurements
Results: dynamic test cont.

- GPS accuracy (2-3 m) quite low compared to buffer sizes
- Data logger not effective
- Average traveling speed: main roads (15.5 km/h), secondary roads (7.8 km/h)
- Corresponding minimum braking distances (model): 10-11 meters (main roads), 4-5 meters secondary roads
Conclusions

- A buffer (e.g. 90 cm) can be used to ensure that all alerts are within a safe limit.
- Device generally functioned as per manufacturer’s parameters.
- Good readings through obstacles.
- Device should centered on the machine for appropriate and accurate readings.
- Dynamic data was unreliable. Improved GPS and data logger tech needed.
Conclusions cont.

- Speeds were accurately measured
- System distance settings should be adjusted for machine speed and braking distance
- It is anticipated that the range could be extended for conditions and still provide reliable results.
- Additional standards and safety controls are still advised.
Discussions

- Underground powerlines appear to induce false alarms
- System cannot make a difference between one PAD or multiple PADS within its range
- XL PAD’s cord occasionally bothers
- Operators prefer to have the warning module closer to the dashboard
- Potential improvements: multiple pre-set calibrations (long-short range) easy to switch, PAD identification capability
Aknowledgements

- Prince George CANFOR’s sawmill team
- Frederick Energy, LLC (Hit-Not Proximity Detection manufacturer)