



OUR NAME IS INNOVATION

International Research on Winch-assist Equipment

WR COFE “Improving Forest Harvest Operations”
January 19, 2017

Dzhamal Amishev, Researcher, Fibre Supply

Outline

- Steep Slopes
- Winch-Assist “numbers”
- Safety Alerts
- Research focus
- Summary



Steep Slopes

Serious Incident Rate – off work more than 30 days

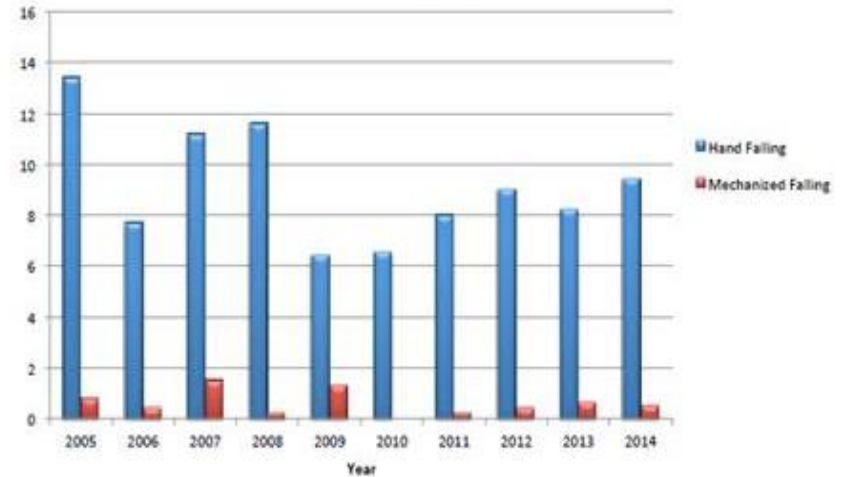
- People {
- Safety!
 - Labour shortage

- Fibre {
- Harvest profile
 - Fibre supply

- Cost {
- Expensive gear
 - Increased costs

- Eco-system {
- Environmental

Hand Falling vs Mechanized Falling
Serious Injury Rate



Steep Slopes - Canada



COLD AND ICE
COLD AND ICE





FPINNOVATIONS STEEP SLOPE INITIATIVE

GOALS

- Reduce accidents
- Increase margins
- Improve access to economically available timber

<http://steepslopeinitiative.fpinnovations.ca/>

- Several steep slope FPI reports and Info Notes being produced.



FPIinnovations 
INFO NOTE

June 2016 / Info Note No. 12

Winch-Assist Technologies available to Western Canada

July 2016 – Technical report no. 37

Dzhamal Amishev, Researcher, Fibre Supply Group

T-MAR LC150 TRACTION WINCH

Brian Boswell, RPF, Senior Scientist, Fibre Supply

Introduction

T-Mar Industries has developed the first Canadian winch-assist machine for steep slope harvesting (Figure 1). T-Mar studied systems around the world before coming up with a product for west coast conditions. The LC150 was designed and built in six months for Starks Timber Processing of Puyallup, Washington. Starks contracts for Weyerhaeuser and Simpson Timber and had experimented with winch-assist using a Lantec yarder. Knowing what they wanted, Starks worked with T-Mar to match the design to their vision.



Figure 1.
T-Mar LC150 traction winch

Restricted to members and partners of FPIinnovations

FPIInnovations Steep Slope Initiative

STEEP SLOPE INITIATIVE

HOME GOALS PROJECTS COMMUNICATIONS OUR TEAM

Events
Videos
Reports
News

Steep Slope is a five-year initiative

Engages forest industry members, equipment manufacturers and distributors, regulators and other stakeholders to build a common vision and strategy to overcome the challenges of harvesting on steep slopes.

READ MORE

Do you need more information? [Contact Us >](#)

GOALS Projects Extension



- Industry Advisors
- Website
- Newsletter
- Social Media
- Demos
- Workshops
- Videos
- Researcher presentations
- International

in Search for people, jobs, companies, and more...

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FPIInnovations Steep Slope Initiative

100 members

<http://steepslopeinitiative.fpinnovations.ca/>

FFE Falcon



EMS Tractionline



T-Winch



Haas/John Deere



Ponsse



HSM



ROB

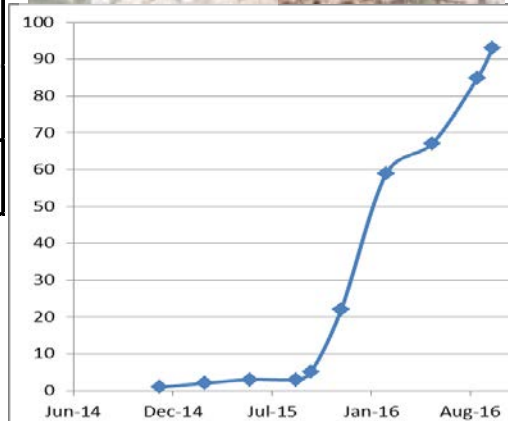
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Winch-Assist Wave in BC

Winch Machines	Western Canada		US PNW		
	Current	Planned	Current	Planned	
Climbmax	5	2		1	
ROB	7	5	1		
Haas	2	5			
HSM	2	3			
Herzog/Alpine	1	4	4		
EMS	1	4	8	8	
Summit		1	9	12	
T-Mar			1		
FFE	3	3			
T-Winch	1				
Total	22	27	23	21	93

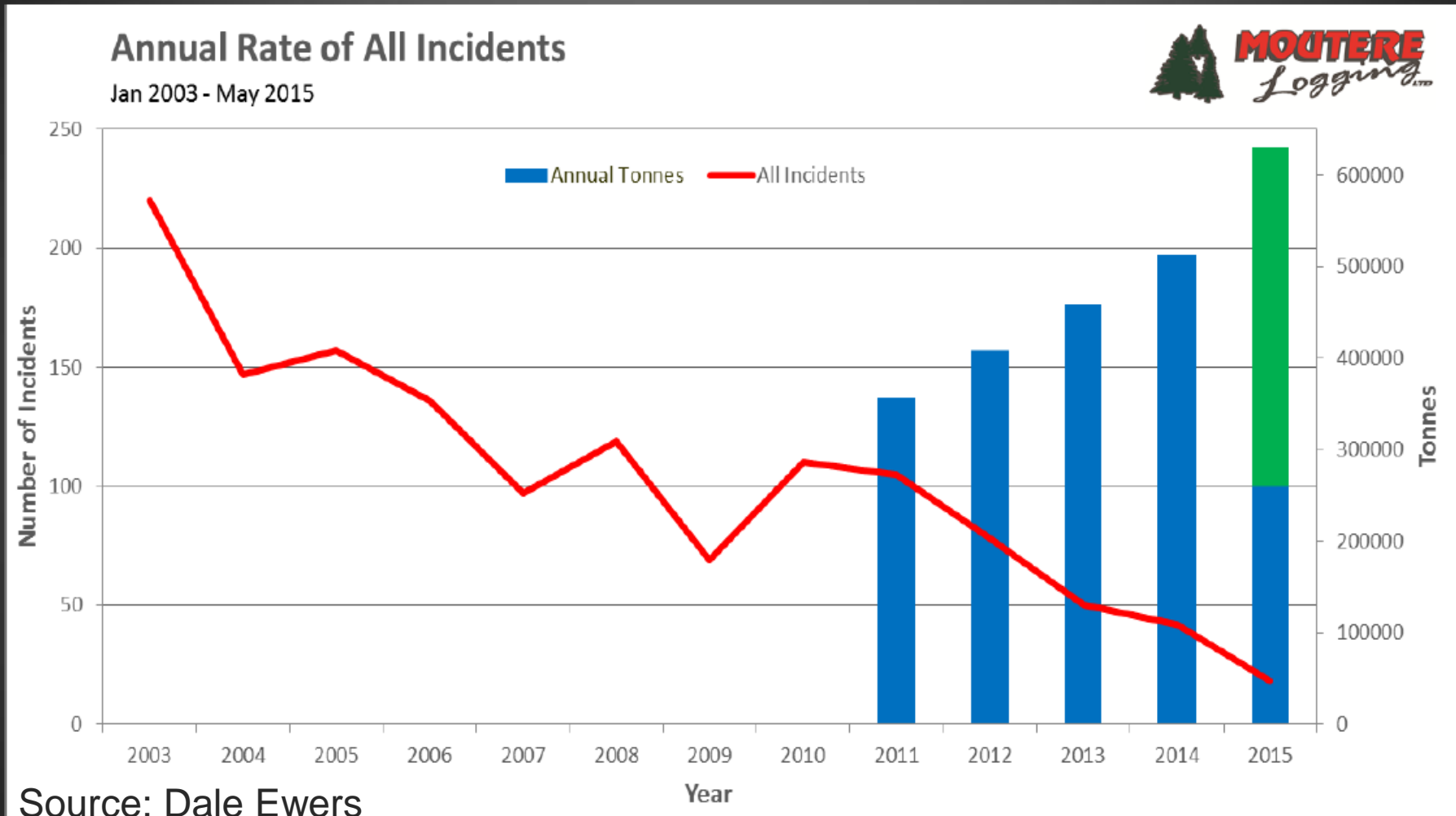


- 49 machines purchased/planned in Canada



Why Winch-Assist? Safety

It Is About Our People



International Developments

First Serious Incident



Man seriously injured in Canterbury logging incident

Last updated 09:02, June 14 2016



WESTPAC RESCUE HELICOPTER

International Developments

Kiwi Incidents:

- Several (10-12) cable failures
 - Both single- and double-cable systems
 - Anchor (excavator) tip-overs
 - Winch drum detached from anchor
 - Cable released from obstacle/rub tree
 - Attachment points have also failed
 - Broken shackles
-
- **Highlights need for R&D in this area**



SAFETY ALERT

Cable Assist Drawbar - Mechanical Failure

Background

A cable assisted feller buncher was walking down a 20 degree slope, as it turned to go around a tree the eye of the drawbar failed catastrophically. The failure allowed the shackle connecting the feller buncher to be pulled through the eye of the drawbar and left the feller buncher without cable assist. The feller buncher remained stable during the incident.

The drawbar had been certified in September 2013 to 24 tonne SWL.

The drawbar and operator have contributed in excess of 3000 hours of cable assist.



Photo 1: Draw bar

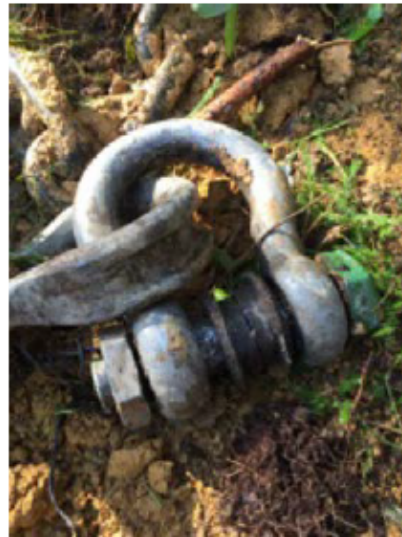


Photo 2: Shackle with remnants of eye on pin



Photo 3: Eye of draw bar

Source:
R.Visser 2016

HAZARD ALERT!

TETHERED FELLING MACHINE ROLL OVER



Background:

A felling machine was traveling back up the same path he came down on, towards the tethering machine, bunching trees as he went. At the time of the incident he was parked on, or near, a rocky outcrop and was moving wind thrown trees out of the way. As he slewed the felling head around the left side track lost traction, which caused the right track to lift off the ground. This in turn caused the felling machine to start tipping over. The operator hit the control to get the tethering machine to increase the tethering rope tension, which momentarily held the felling machine but because it was at such a high angle it continued to tip, then rolled onto its roof, where it came to a stop. The operator exited the machine, uninjured, through the main door.

Learning from this incident:

- The machine was positioned incorrectly over a small rocky outcrop – it should have been above or below the small rocky outcrop to get stable footing. This was due to the operator being too complacent, as he had been working on relatively gentle slopes for most of this setting.
- Need to be aware of machine position when on upset terrain and/or slewing to the side with

Source:
R.Visser 2016

SAFETY ALERT

Broken Tether Rope

Background

Unbeknown to the operator the ropes of a twin drum cable-assist machine crossed over one another in front of a stump. The machine began to in-haul and, under tension, one of the winch ropes broke at the ferrule.

Neither the tether nor the harvesting machine lost its footing.

No one was injured.

Contributing factors:

The ropes crossed below a tree stump and outside of the operator's line of sight



Re-enactment

Hazard Alert

ClimbMAX Harvester Rolled onto its side



Incident

A ClimbMAX winch assisted felling machine was entering a new face from off a formed track. Due to a rock outcrop, it was decided to walk 10m up from the deadman location to enter the work area, this put a sharp angle in the wire from the machine to the anchor point. When the operator drove over the edge of the track the weight of the machine unearthed a high stump which caused the machine to lift onto the stump reducing traction ability, now tension from the wire was being applied resulting in the base machine being screwed sideways, the operator was unable to reposition the boom fast enough resulting in the machine rolling onto its side.



1. The Operator was not injured
2. There was no damage to the machine
3. The slope was 83% or 40 degrees
4. There was no fuel or oil lost from the machine, protecting the environment.

Source:
R.Visser 2016

Safety Alerts

- Industry hesitant to report winch-assist incidents.
- Most incidents are mistakes, but important to learn from our mistakes!
 - Important to report all incidents.
 - Important to provide all details.



**All incidents are preventable;
near misses are gifts**

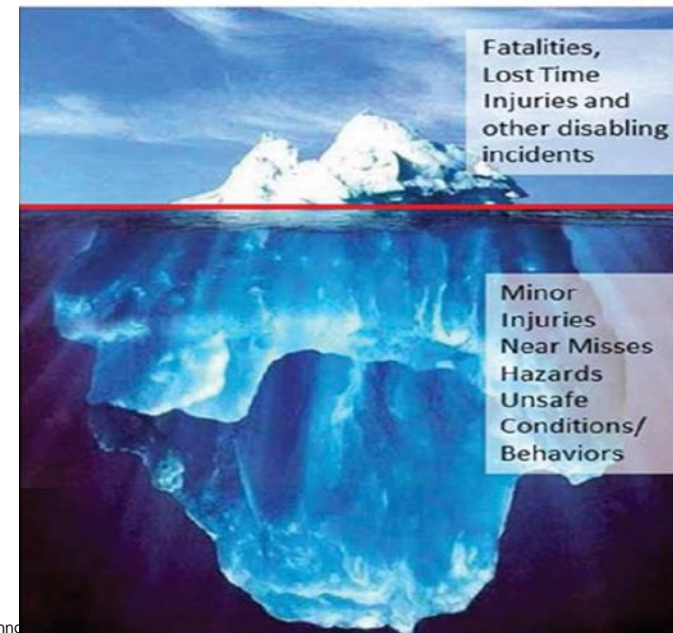


Cherie Whelan.

Today, I'm going to talk about incidents that really had a significant impact and what I think the biggest lessons learned from them are.

"I was in Edmonton at the University of Alberta Hospital doing an interview with burn victims from an explosion that happened in Fort McMurray. I don't know if any of you have ever been to the hospital."

Tip of the Iceberg



Calculating Safe Operating Limits

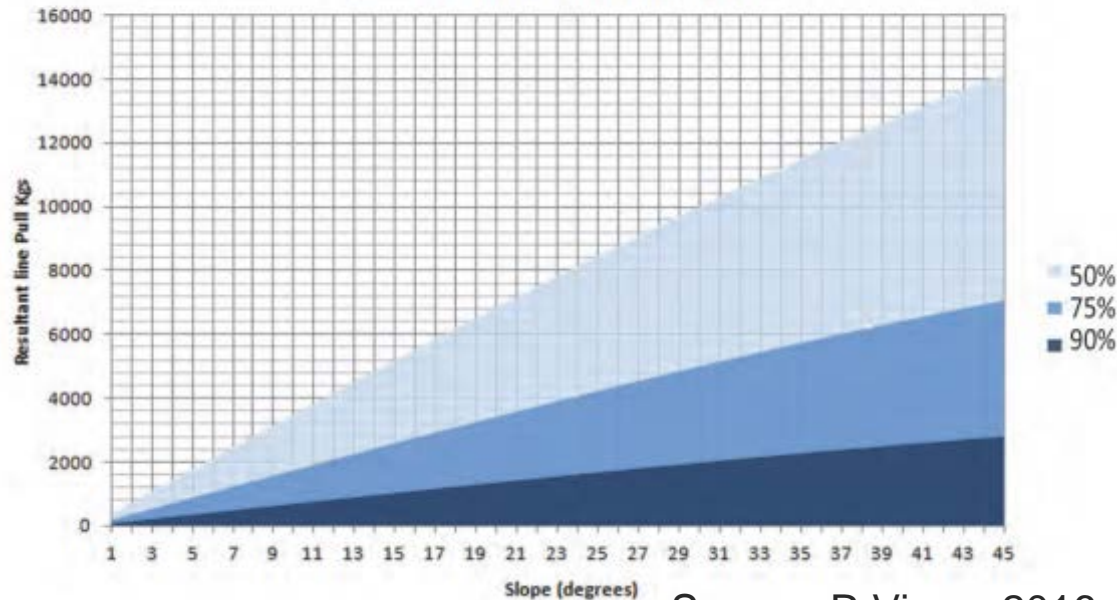
Coefficient of Friction determines Tractive Effort

- % 100 - 90 TE- Dry, load bearing ground.
- % 90 - 70 TE- Brown earth under moderate climatic conditions.
- % 70 - 50 TE- Soil with high clay content under wet conditions.
- % 50 – 0 TE - Wet soft/boggy ground.

Machine Weight	40	Tonnes
Terrain Slope	35	Degrees
Traction Efficiency	70	%
Cable Assist Tension	0	Tonnes
Working Force	0	Tonnes
Gravity Force	22.9	Tonnes
Normal Force	32.8	Tonnes
Traction Force	22.9	Tonnes
Residual Force	0.0	Tonnes

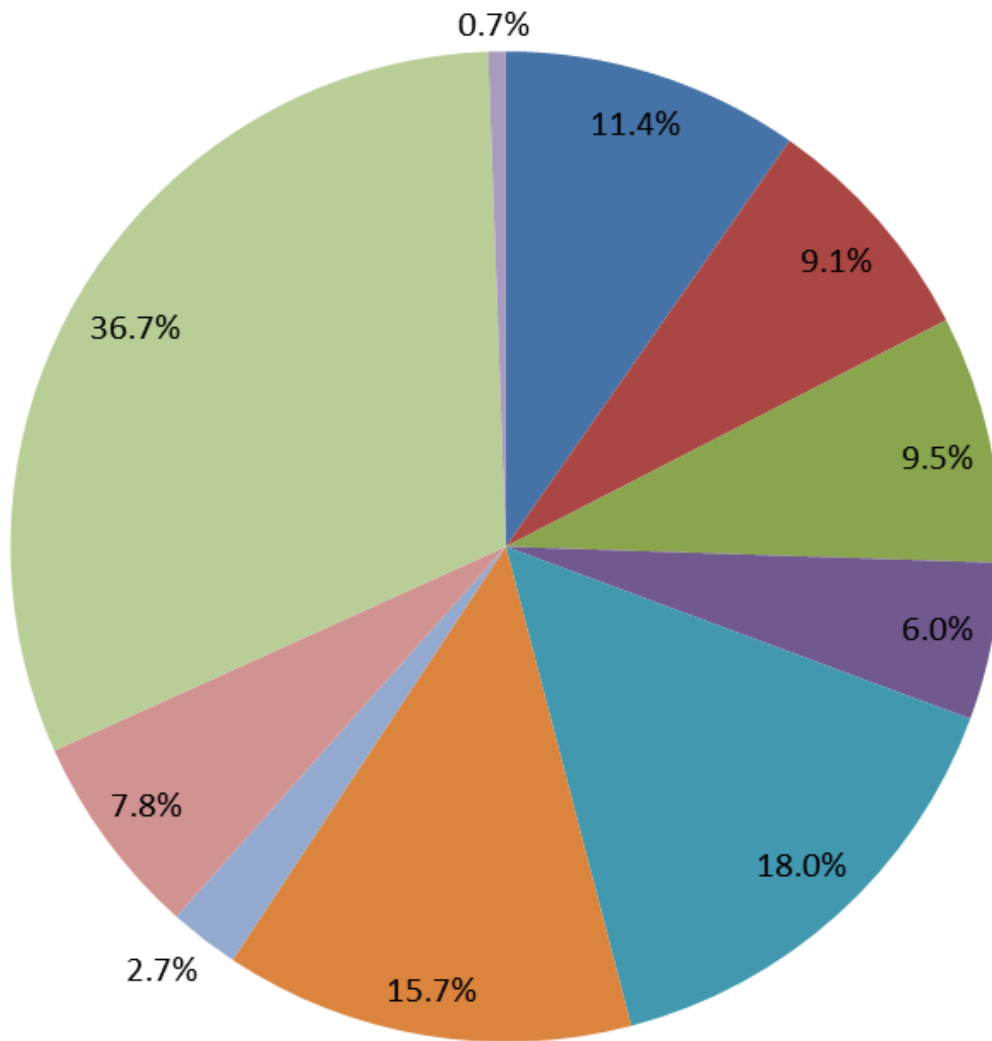
prohibited. ©

Line Pull vs Terrain
(Based on 35 tonne tethered machine)

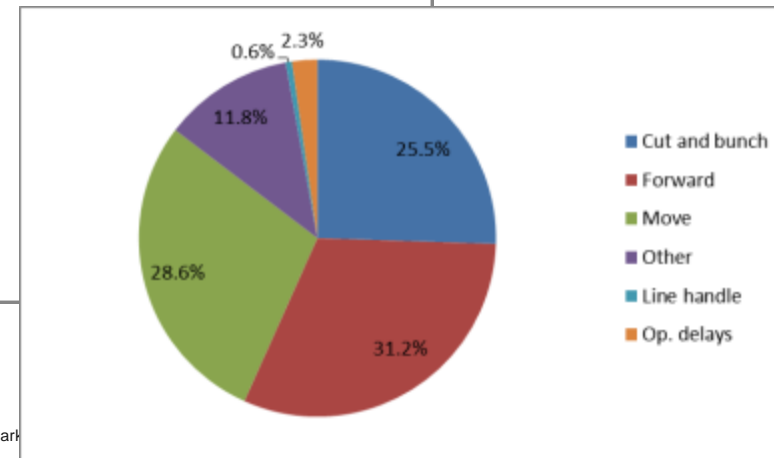


Source: R.Visser 2016

Research focus: Productivity

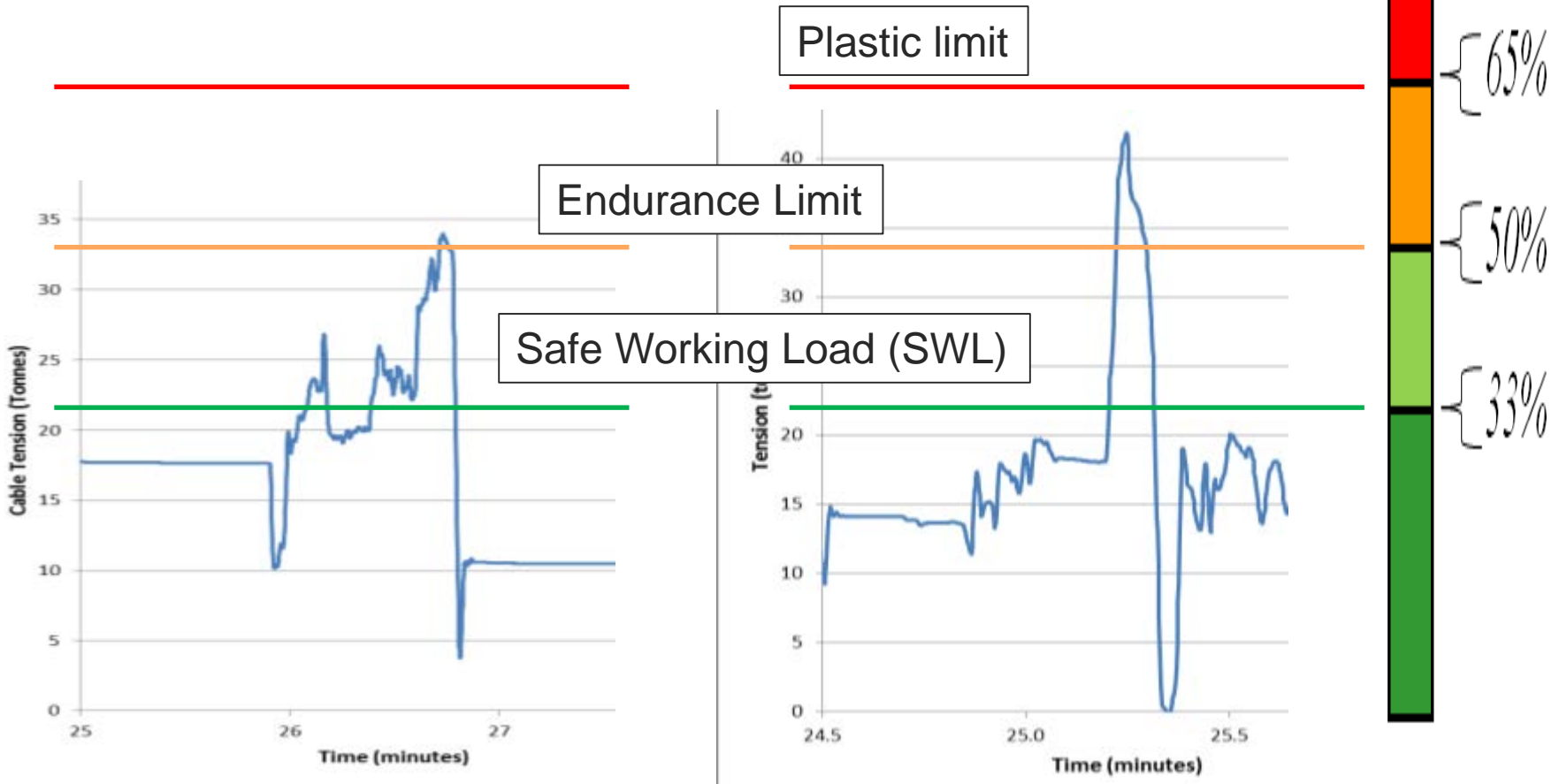


- Bunch
- Cut
- Swing and grab
- Shrub brush
- Travel (downhill)
- Travel (uphill)
- Operational delay
- Other
- Forward
- Line handle



Research focus: Tension

- Extreme tension events:



Research focus: Anchors

■ Anchors:

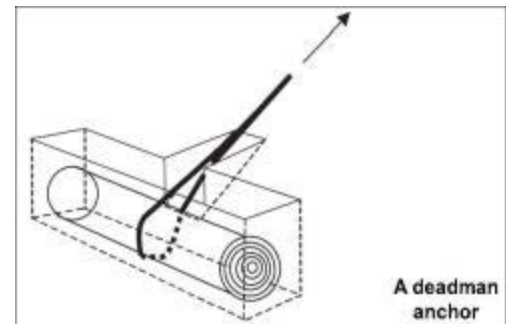
Stumps:

- Strong stump...or multiple stumps
- Fresh stumps, strong soils



Deadman:

- 4m deep, 50cm diam & 5m length log
- Install at right angles
 - ... Notch?
 - ... Horizontal angle?



Source:
R.Visser 2016

Research focus: Strength

■ End Connectors:



Hand Spliced Eye



Pressed Thimble Eye



Pressed Solid Thimble Eye



Pressed Soft Eye



Wire Rope Clips



Spelter Socket



Split Wedge Ferrules



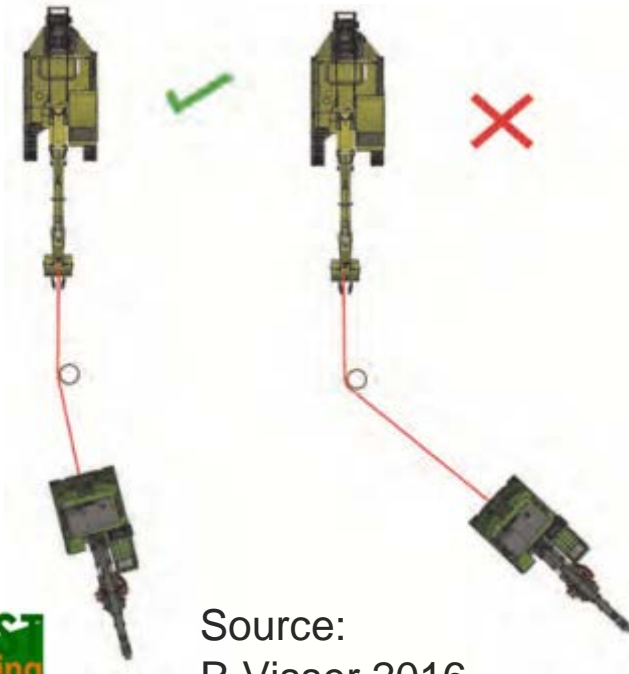
Flemish Eye



Source:
R.Visser 2016

Research focus: Rub trees

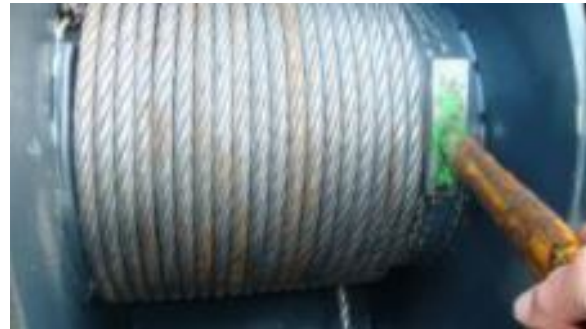
- **Use trees to change direction :**
 - Tension drop through friction around tree
 - Pull over trees
 - Rope can cut / bind into the tree
 - Rope and tree heat up



Source:
R.Visser 2016

Research focus: Best Practices

- Builds on New Zealand documents and field observations, work with stakeholders
- Continuous Improvement
- International knowledge exchange
- Adaptation to PNW
- Discussion paper – a living document



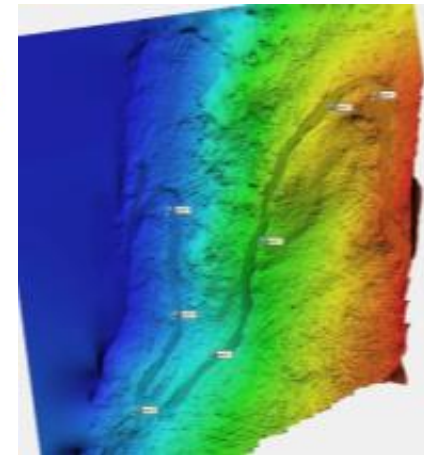
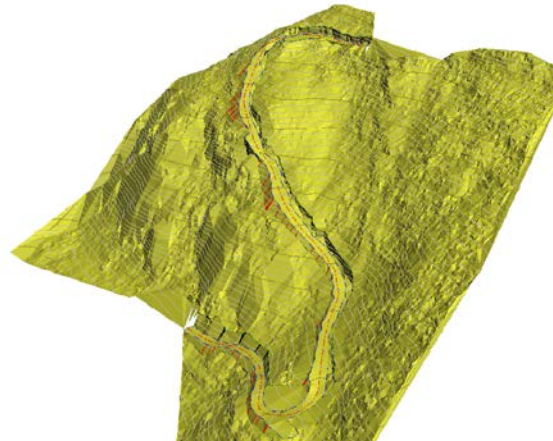
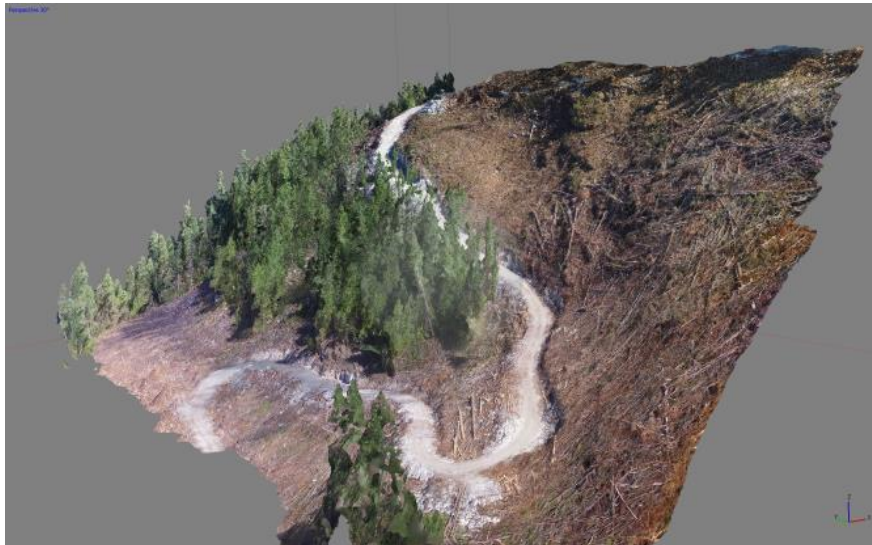
Research focus: Environmental

- Working Group established
- Methodology discussion, remote sensing



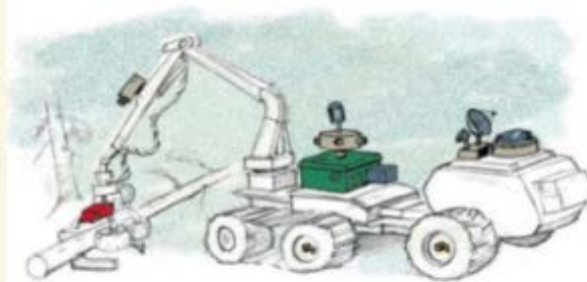
Research focus: Remote Sensing

- LiDAR assessing safety and hazards report in progress
- Steep slope road construction



Research focus: Remote Control

- Collaborations in development
 - UBC – Kevin Lyons
- Tech Watch



SUMMARY

- Winch-assist technology is evolving
- Safe practices/due diligence vital
- FPIinnovations facilitates:
 - Continuous improvement
 - Information sharing
 - Develop Best Management Practices
- Will provide for a safer industry!



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Thank you

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<http://steepslopeinitiative.fpinnovations.ca/>

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