



Assessment of a semi-automated system for counting, measuring and tracking of export logs



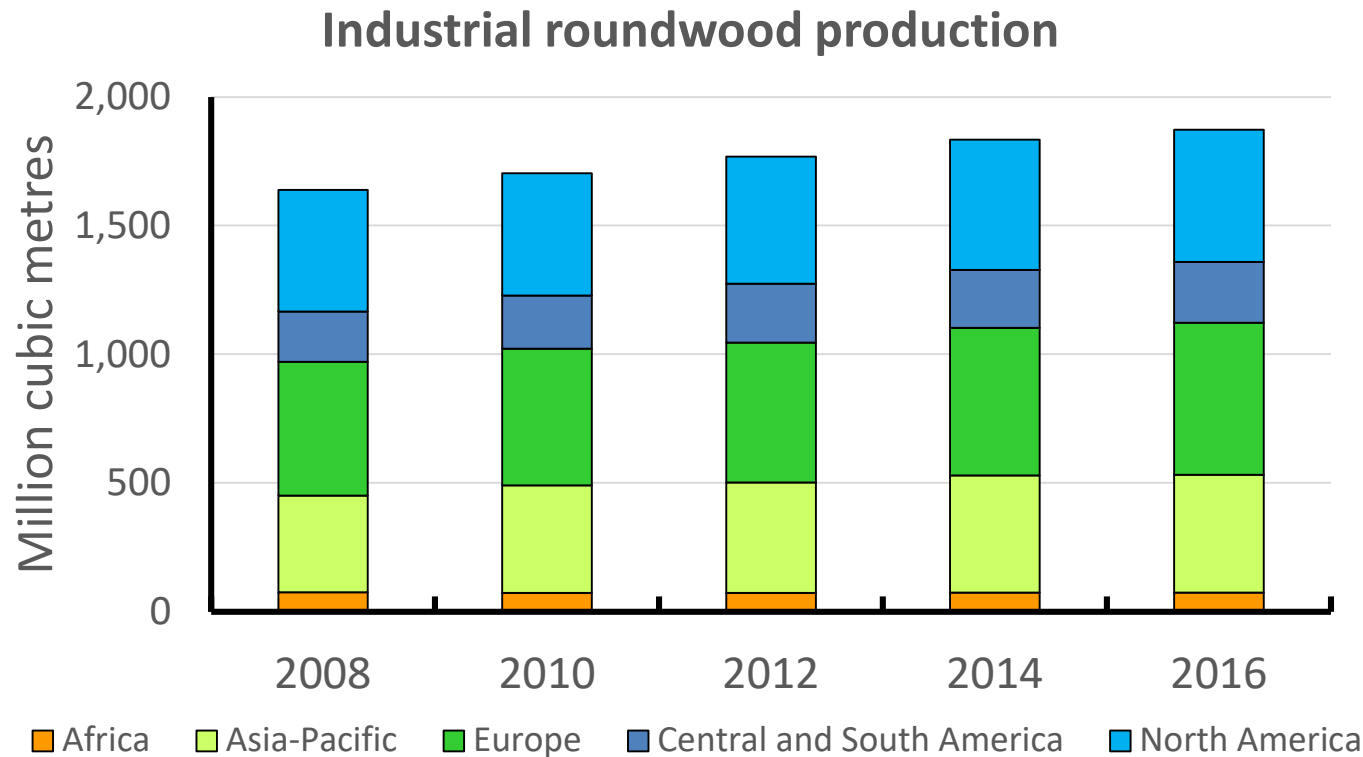
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C3 Ltd

Forest Engineering Conference – Rotorua, New Zealand – April 2018



Global production and trade



Global industrial roundwood production = 1.874 billion m³

Global trade in industrial roundwood = 122 million m³ ~7%

New Zealand: world's largest softwood log exporter every year since 2013.



Who are C3?

- NZ's largest on-wharf logistics company

- stevedoring
- marshalling
- warehousing
- wharf cartage



- Handle wide range of products

- Break bulk, e.g. fertiliser
- Steel
- General cargo
- Logs and forest products

- Operate in 15 ports in NZ and Australia



How important are logs to C3?

- Logs are C3's largest cargo by volume
- In the last 8 years have tagged, measured, handled, and tracked over
 - 100 million tonnes of logs
 - 260 million individual logs





Current System – Scaling Shed



- Length from truck docket
- Bar code tags applied
- Log count checked
- Small end UB diameters measured
- Log volumes calculated
- Truck sent to storage row





Current System – Storage



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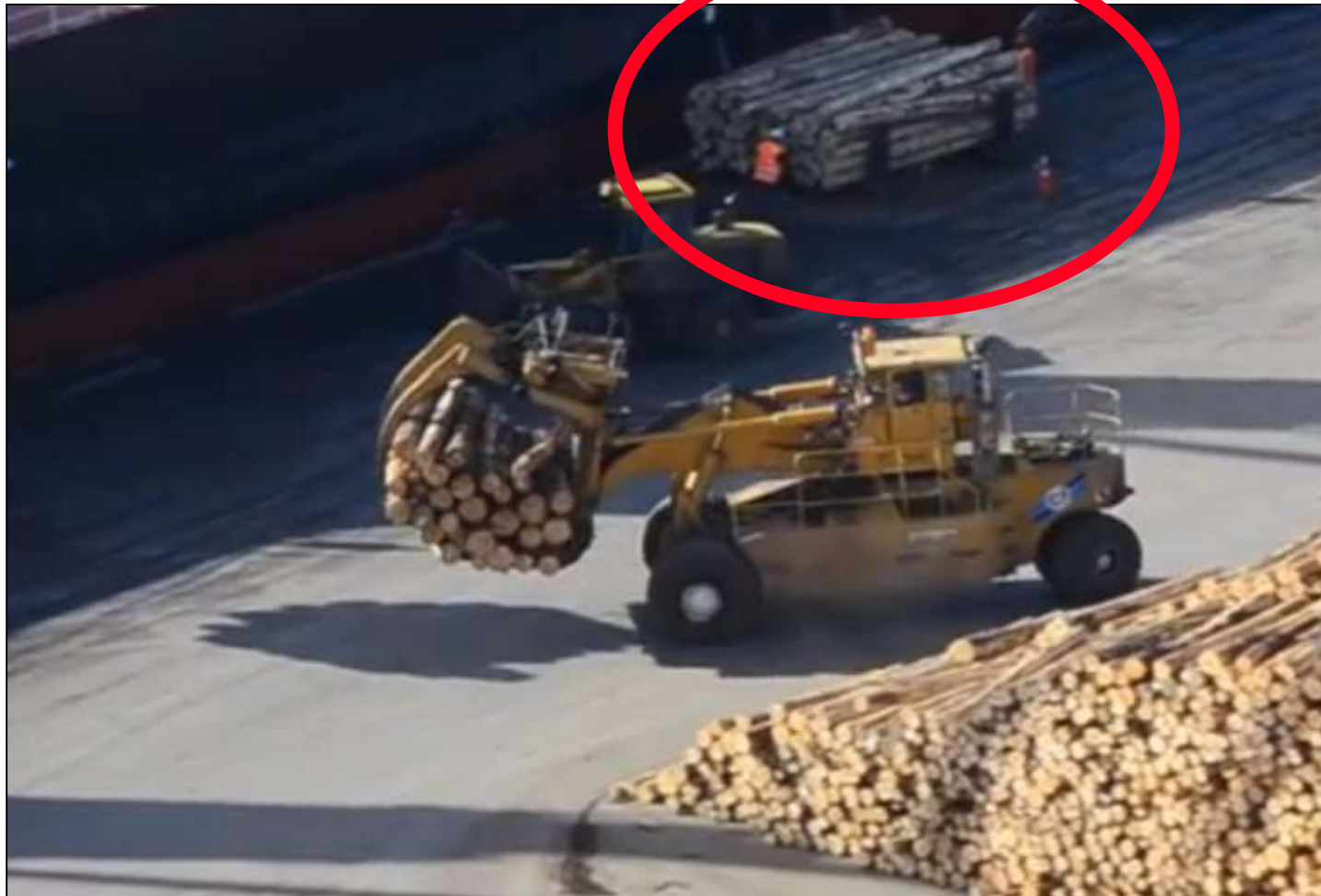
Current System – To Shipside



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Current System – To Shipside





Current System – On Ship

- Right volume
- Right supplier
- Right destination



- ✓ Every log accounted for
- ✓ Where stowed
- ✓ Every log ID'd



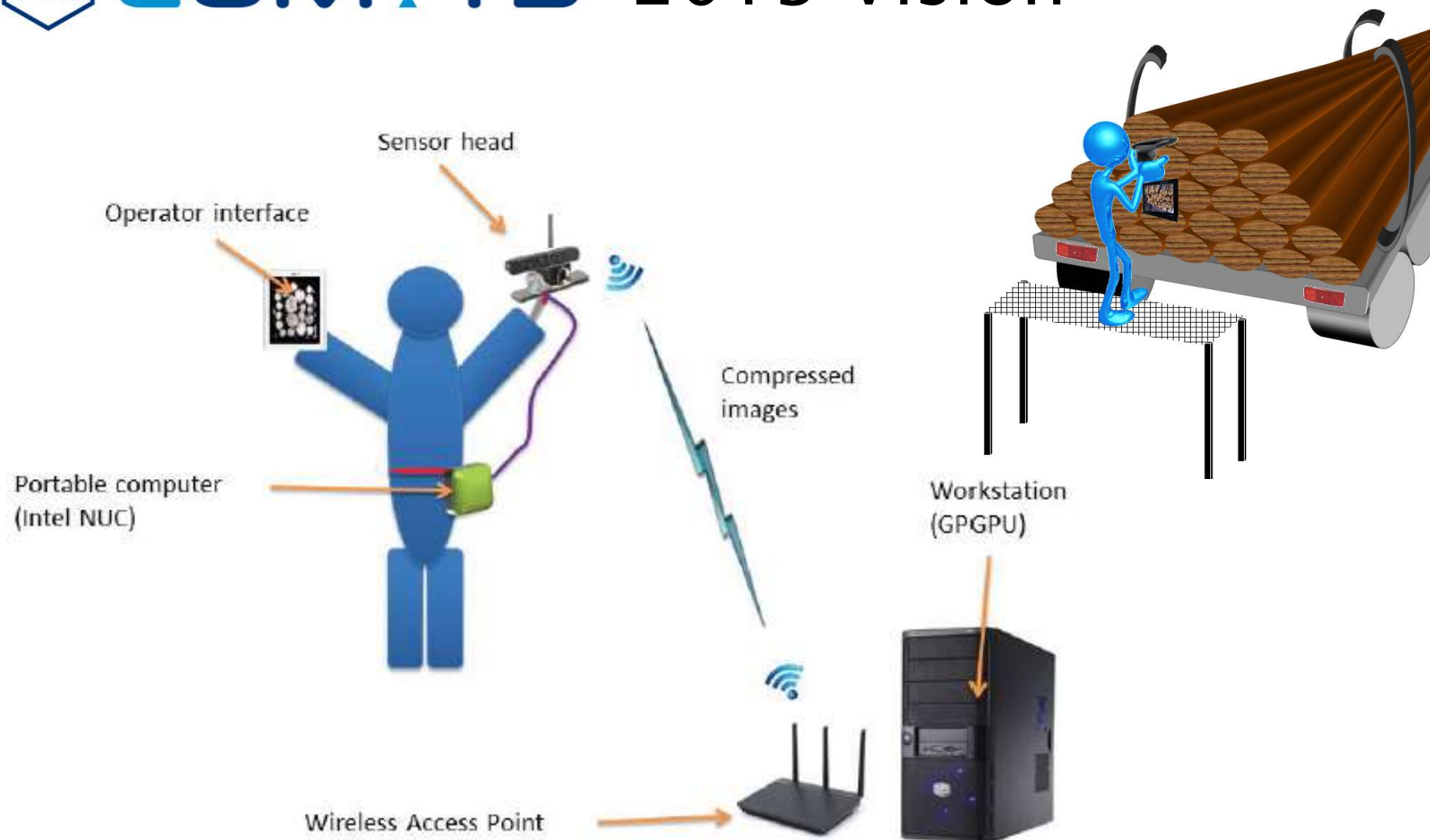
C3's Challenge

- Improve customer service via:
 - Increased and time efficient truck throughput;
 - Increased vessel loading productivity;
 - Increased data integrity; and
 - Improved safety hazard environment.
- Provide innovative solution and services to international marketplace

COM³TS

COunt, MEasure, Track Simultaneously

COMETS 2013 Vision



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Improved Counting – Pre-Arrival

Dockets

Pre-Note 5

Dockets 168



Piece Count: 181





Voda NZ 11:30 AM

< Bush Docket Add Load



Docket 1



 Docket 1 11:25:16 AM 

 Packet 1 11:30:12 AM 

[+ Add Packet](#)

Docket 2

 Docket 2 11:29:30 AM 

 Packet 1 11:30:23 AM 

[+ Add Packet](#)

Docket 3

Submit



Improved Counting – Shipside

Lift Image (559465)

Image

Detail

Count **40**



Clear

Radius +

Radius -

Hide

Disco Mode

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COM³TS



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COM³TS vs Current Manual



Operational Trial: Goals

- To assess the accuracy (precision and bias) of the latest version of **COMETS** in an operational trial and compare these with manual scaling
- To assess the efficiency gains resulting from the use of **COMETS** compared with manual scaling
- To build up a large operational dataset for “machine learning” and testing of future software improvements.





Operational Trial: Accuracy

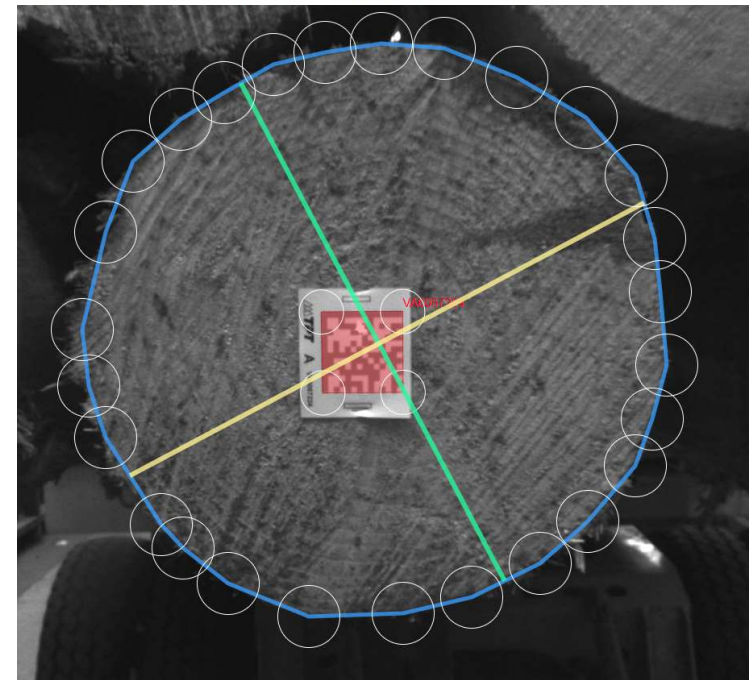
- 30,000 logs were ticketed and measured over 4 month period
- Each log scaled using current manual system and using **COMETS**
- A random subset of 898 logs check-scaled by an expert scaler (“the gold standard”)



Operational Trial: Results

- Maximum bias allowed for logs scaled on truck or on rail wagon is $\pm 3\%$ of volume.
- Compared with check-scaler, manual scaling over-scaled volume by 0.88%
- Compared with check-scaler, **COM³TS** under-scaled volume by 0.04%

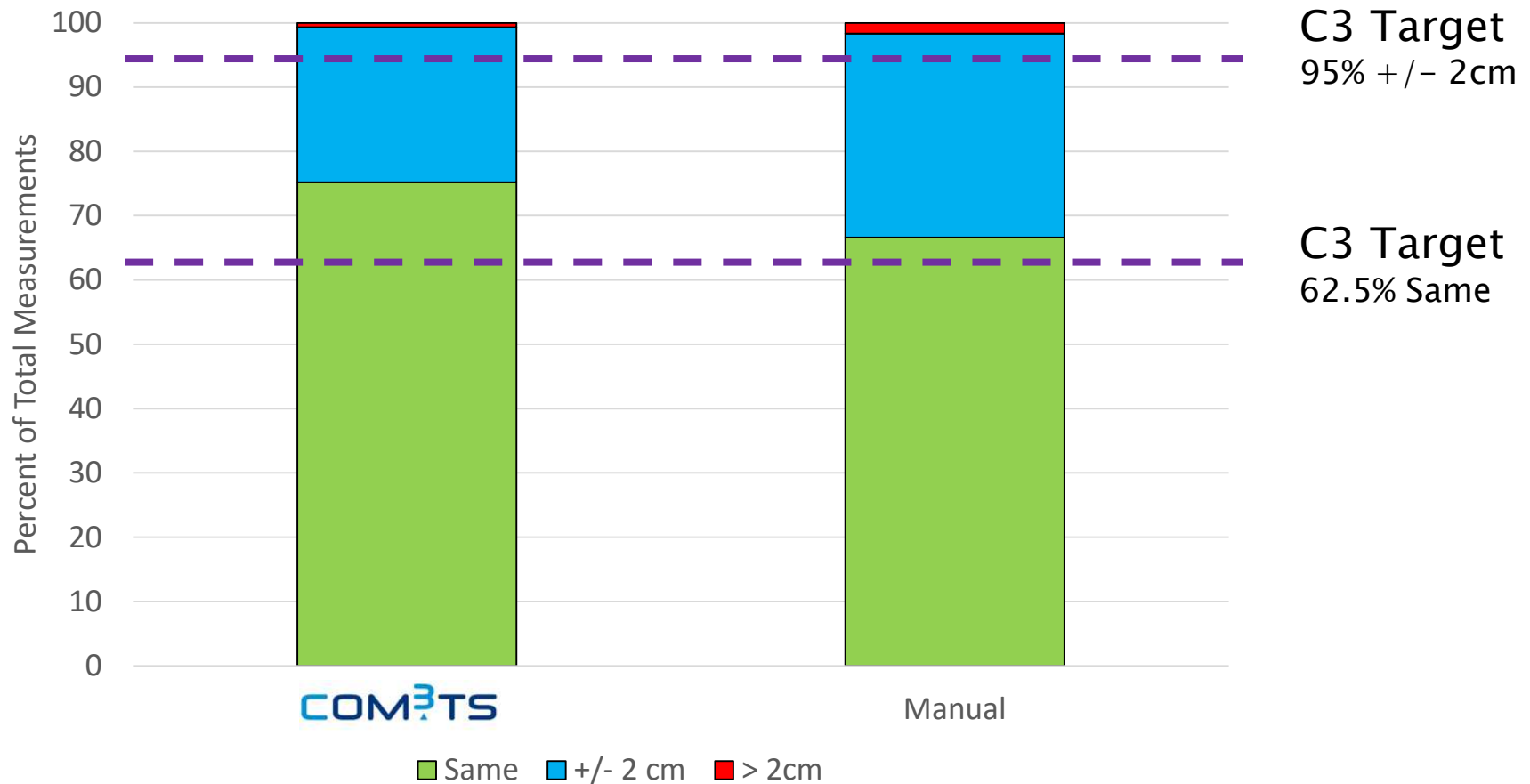
Measurement: 0.347 m | Perpendicular: 0.360 m | Volume (JAS): 1.733 m³ | Length: 12 m





Operational Trial: Results

Precision of JAS Diameter Measurements
(Compared with Check-Scalers Measurements)



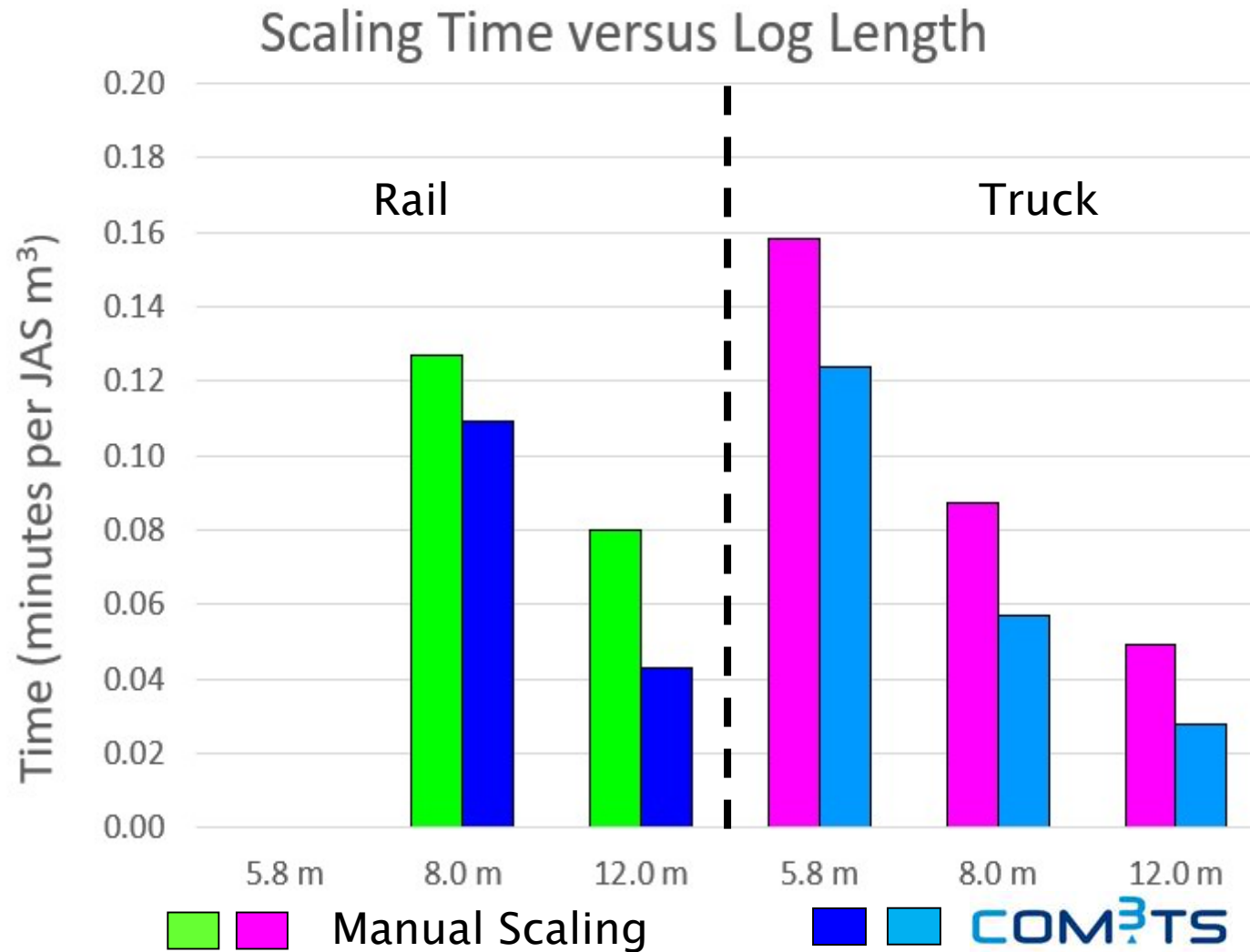


Operational Trial: Efficiency

- Time studies based on video footage and real-time site visits were used to measure ticketing and scaling times (nearest 1 / 100th minute).
- Normal scaling of 42 rail wagon loads and 54 truckloads were timed.
- COM³TS scaling of 40 rail wagon loads and 26 truckloads were timed.
- Times were compared on minutes per log and minutes per JAS m³ criteria.



Operational Trial: Results





Concluding Comments from Trial

- COMETS was less biased and more precise than the current manual scaling system
- COMETS scaling was 14 to 46% faster (= more efficient) than the current manual scaling system*

* Excludes ticketing and delays



Where to Next

- Increase range of log grades and move to make the system more portable.
- Integrate **COMETS** with redefined business processes across NZ ports and internationally
- Continuous improvement
- Automated scaling

