

# Log Scanning Trials



Peter Dyson

Researcher

FPIinnovations Forest Operations Division

Location: Bellingham

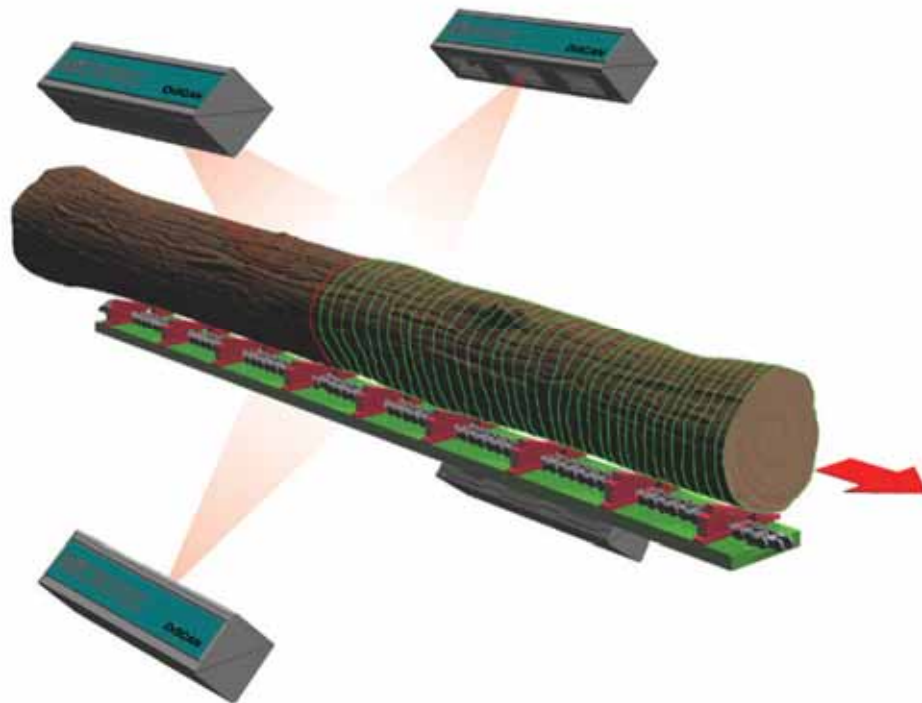
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# Presentation Outline

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1. Introduction to laser log scanning.
2. Canadian Standards Association and Measurement Canada's role in scanner scaling.
3. Recent trials testing laser scanners.
4. British Columbia Provincial Log Scanner Review Committee.

# Laser log scanning



- Scanners emit a low power laser line on the log's surface.
- Cameras in the scanning heads and associated software produce a 3 dimensional image of the log.
- Scanners produce accurate measurements of log diameter. Additional hardware measures log length.

# Background on scanner scaling in Canada

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- There is strong interest by the Canadian forest industry to use laser log scanning technology for scaling logs.
- Measurement Canada must approve scanners before they can be approved for trade.
- Currently Measurement Canada cannot approve scanners as there is no standard in place.
- The Canadian Standards Association (CSA) Technical Committee on Scaling of Primary Forest Products is developing a standard.

# The Canadian Standards Association (CSA) and Measurement Canada

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The CSA Technical Committee on Scaling of Primary Forest Products is developing a standard for laser log scanning which will:

- Focus on requirements for scanner accuracy of diameter and length.
- Provide a minimum standard allowing provincial authorities to specify greater accuracy.
- Not override provincial scaling regulations.

Measurement Canada's role is to develop.

- The legal requirements for scanners (Timber Dimensional Measuring Devices).
- Test procedures for certifying scanners.
- Standards and procedures for inspecting scanners.

# Three recently completed scanner scaling trials

- The first trial was conducted at Western Forest Products Ltd. Cowichan Bay sawmill located on Vancouver Island
- Objective of the trial
  - I. To assess the scanner's measuring accuracy on top diameter, butt diameter and length.
- Study methodology
  - I. The top diameter, butt diameter and length of 62 debarked logs were manually measured by an FPInnovation's researcher.
  - II. The logs were scanned once by the laser log scanner.
  - III. A "test pipe" of known dimensions was also scanned.
  - IV. The manual measurements of the logs and test pipe were compared to the scanner measurements.

# Measuring the study logs and scanning the test pipe



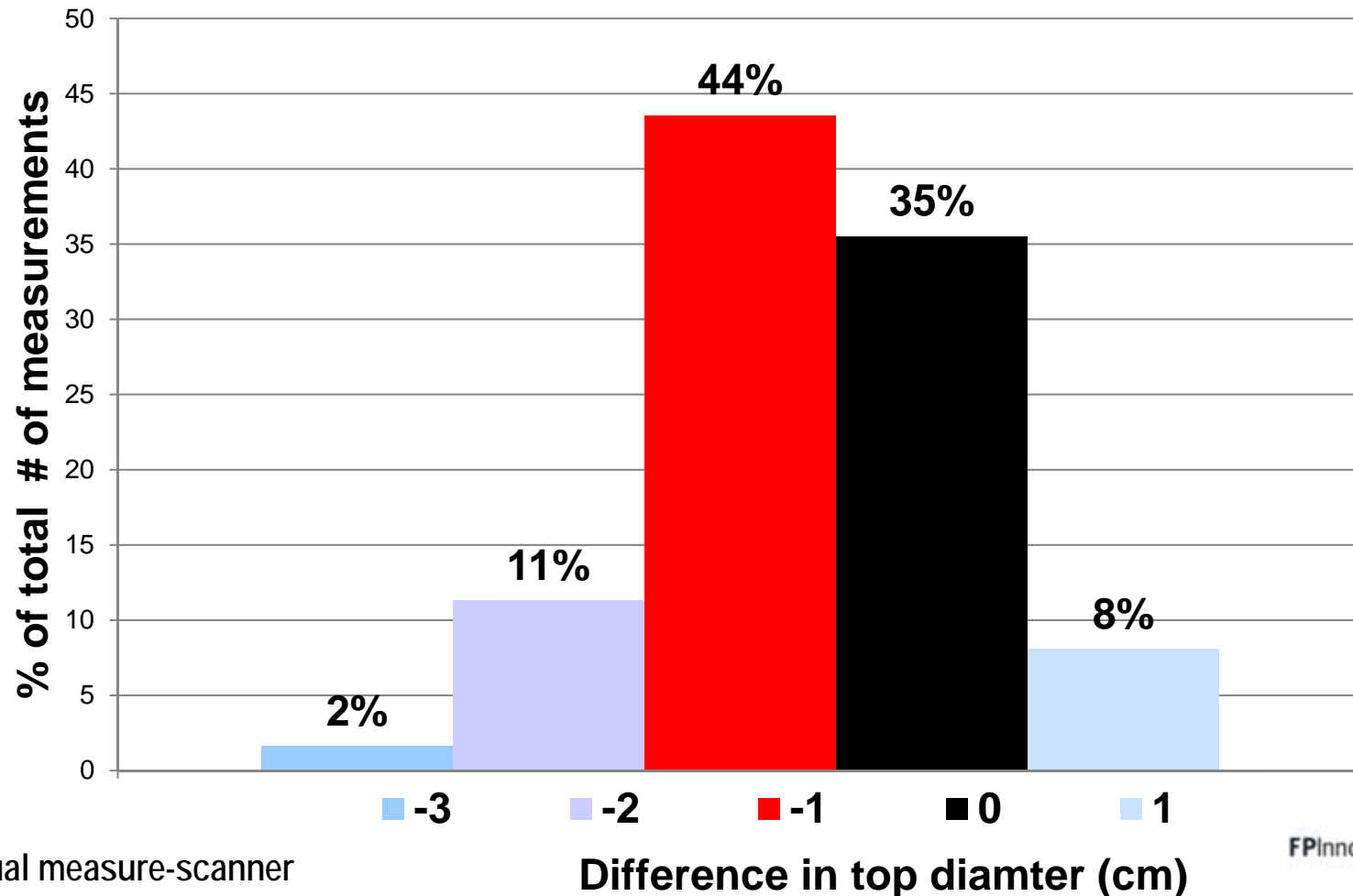
- The top diameter, butt diameter and length were manually measured to the nearest 1 cm (0.4 in).
- Scalers measure diameter in 2 cm (0.8 in.) divisions and length in 10 cm (3.9 in.) increments.

- The PVC pipe is scanned to check scanner accuracy.



# Scanner accuracy of top diameter measure

98% of the scanner measurements were within 2 cm (0.8 in.) of the manual measurements

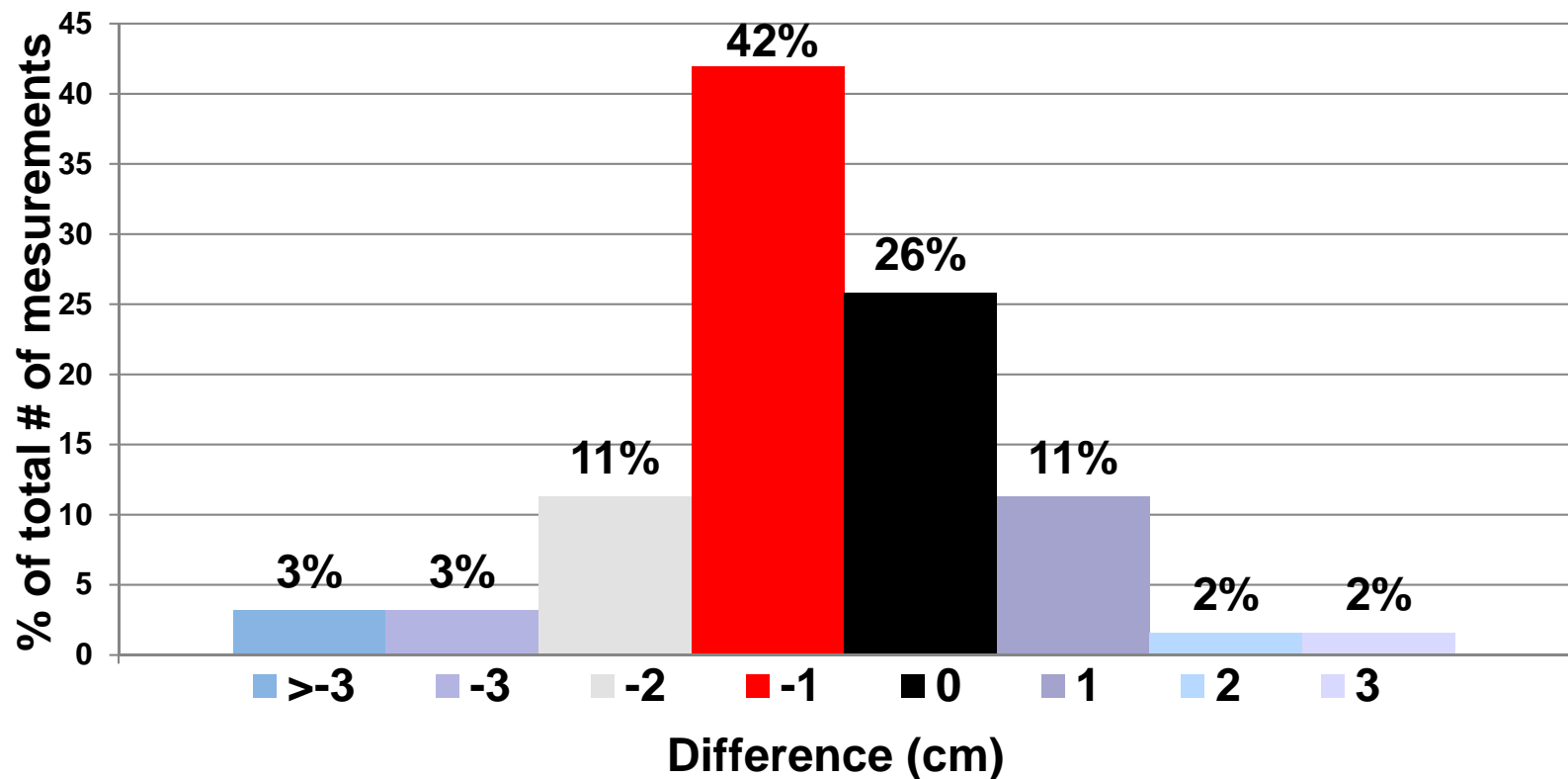


Accuracy = (Manual measure - scanner measure) / manual measure X 100



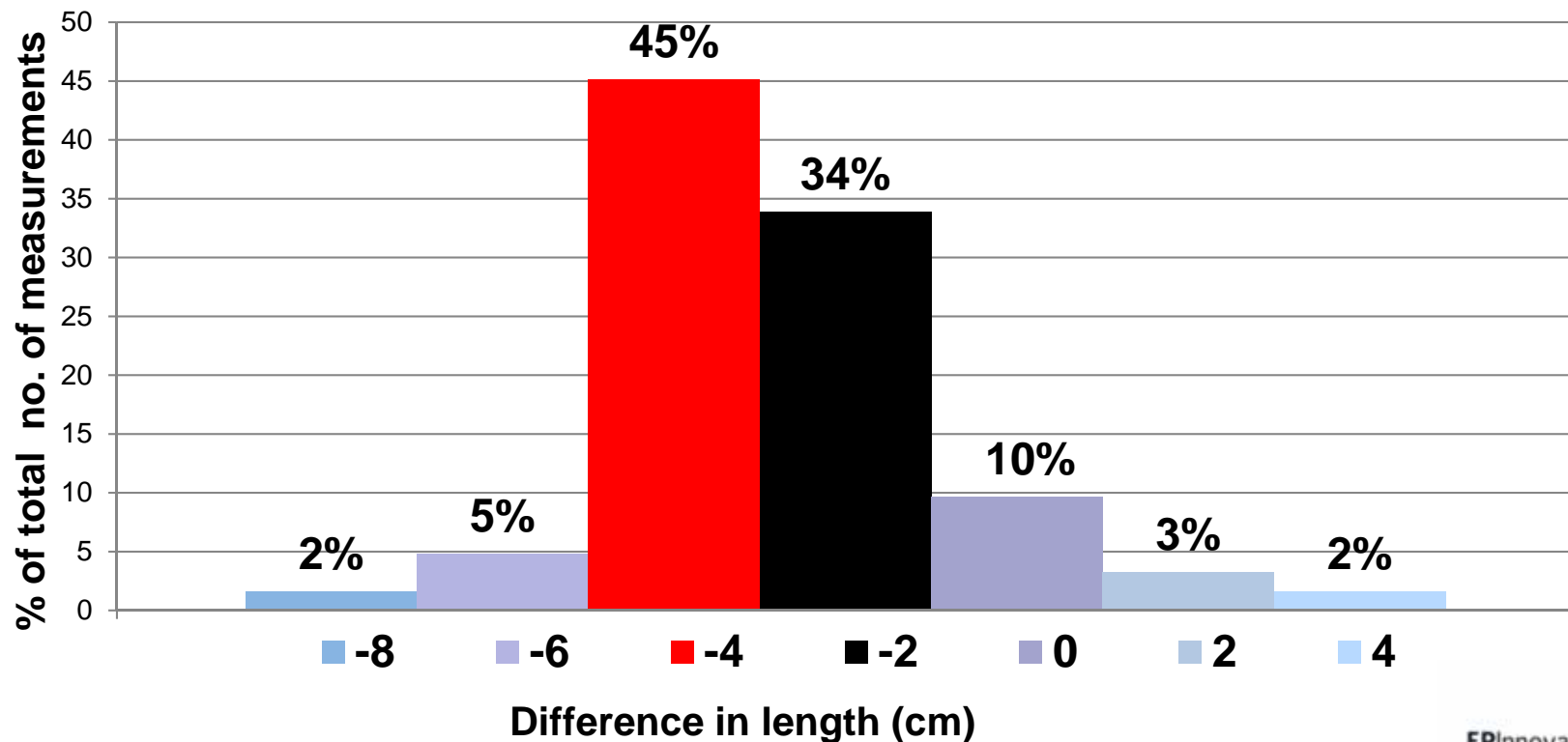
# Scanner accuracy of butt diameter measure

92% of the scanner measurements were within 2 cm (0.8 in.) of the manual measurements

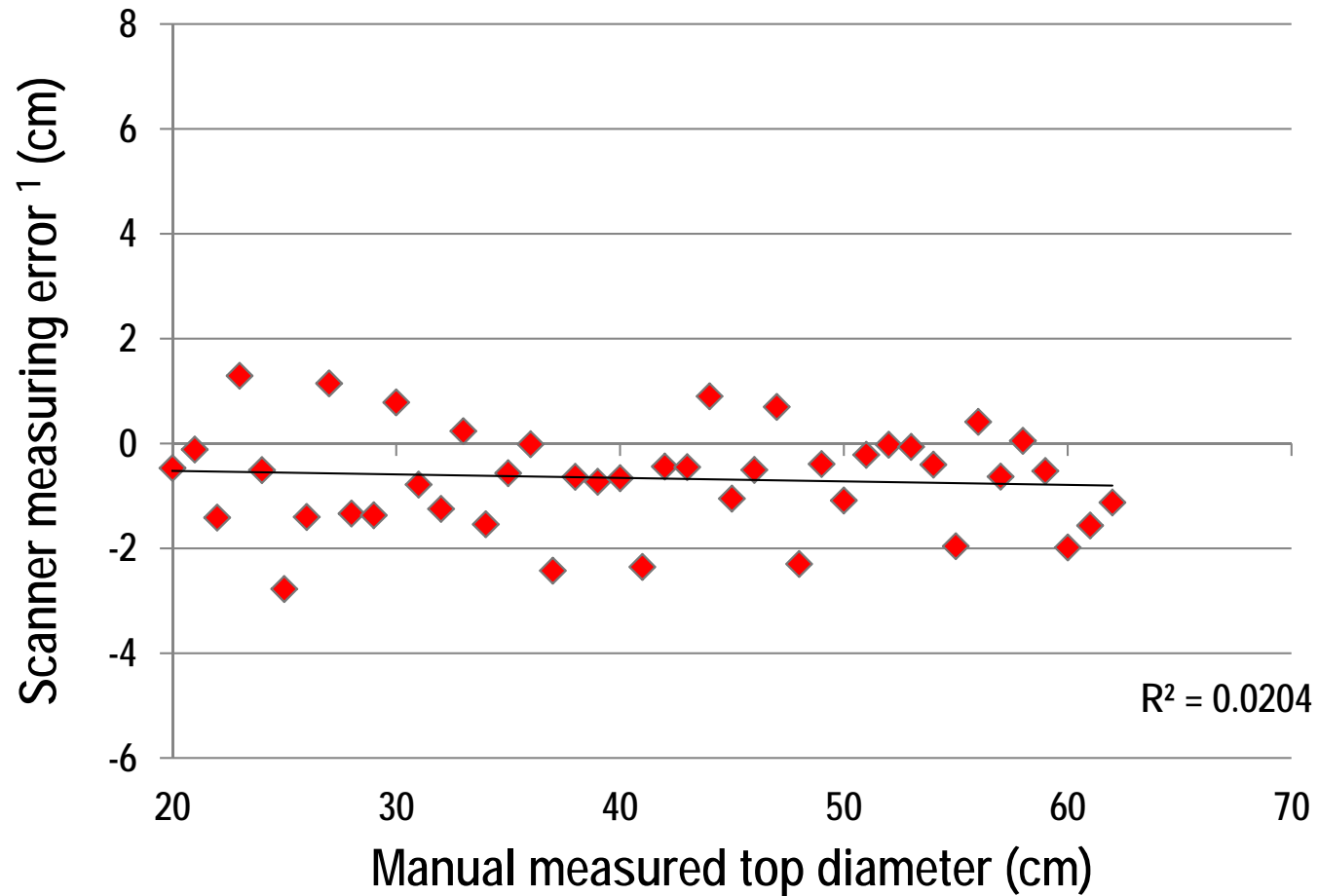


# Scanner accuracy of length measure

- 94 % of the scanner measurements were within 5 cm (2.0 in.) of the manual measurements.
- 100% of the scanner measurements were within 10 cm (3.9 in.) of the manual measurement



# Scanner top diameter measuring error



<sup>1</sup> manual measure-scanner measure

# Scanner accuracy of test pipe

Scanner measurement		Top diam. cm (in.)	Butt diam. cm (in.)	Length cm (in.)
3 scans	Average	26.56 (10.45)	26.58 (10.46)	368.8 (145.19)
	Variance	0.06 (0.01)	0.01 (0.00)	-
Manual measurement		26.51	26.51	365.9 (144.05)
Scanner accuracy <sup>1</sup>		0.2%	0.2%	0.8%

<sup>1</sup> (Manual measure-scanner measure )/manual measure

# Sources of manual measurement error

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- Difficulty in obtaining an accurate diameter measure on irregular shaped and out of round log ends.
- Measuring log ends is difficult because the logs are not separated.
- Measuring the correct length on logs that are not true and straight.

# Evaluations after the first trial

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The trial showed the scanner's measuring accuracy on diameter and length was comparable to British Columbia's scaling accuracy requirements of 2 cm on diameter and 10 cm on length.

The British Columbia Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) wanted to conduct further tests.

- To see if better scanner accuracy could be achieved in a "laboratory setting" with a recently calibrated scanner and at a mill.
- To provide Measurement Canada with a potential method for testing scanners.

FPIinnovations assisted the MFLNRO with a test at FPIinnovations lab in Vancouver and at Western Forest Product's Ladysmith sawmill on Vancouver Island.

# Scanner Test at FPI Innovation's Lab in Vancouver



- The scanner was calibrated.
- 4 test objects and 2 logs were measured to the nearest 1 mm (0.04 in) in circumference and length.
- The scanner diameter and length measurements were compared to manual measures.

Test Objects



# Scanner trial at Western Forest Products Ladysmith sawmill

The same test procedures used at FPInnovations were used on this test

- The scanner was calibrated.
- The circumferences and lengths of 10 logs were measured.
- The logs were scanned at 3 speeds.

Calibrating the scanner



Test Logs



Scanning the logs





# Results from the scanner trials

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- Preliminary results from the trials at FPInnovations and Ladysmith show the scanners at both locations measured length and diameter very close to the manual measure.
- Scanners can measure log diameter and length accurately enough to meet the likely CSA standard and Measurement Canada requirements .
- The trials will help Measurement Canada with developing procedures for field testing scanners.

# British Columbia Provincial Log Scanning Technical Review Committee

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- Provincial authorities set scaling regulations and practices.
- Procedures have to be developed for implementing scanner scaling to meet provincial scaling requirements.
- A working group of industry and Ministry (MFLNRO) officials been examining the issues. They will be making recommendations on how scanner scaling can be implemented to meet provincial scaling requirements.

# Scaling issues the Provincial Technical Committee is examining

- Determining species grade and defect.  
Possible solutions :
  1. Scaler assigns a grade and species for each log.
  2. Species and grade are assigned from a sample.
- Check scaling
- Allowance for bark.  
Possible solutions :
  1. An algorithm in the scanner software deducts bark thickness.
  2. If an operator observes each log during scanning, have the operator deduct bark thickness based on visual observation.
  3. Debark all logs before scanning.

# Conclusions

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- CSA Technical Committee on Scaling of Primary Forest Products is developing a standard for using scanners.
- Measurement Canada is developing test procedures for certifying scanners and ensuring all legal requirements will be met for using scanners for scaling.
- A B.C. scaling committee is examining issues around implementing scanner scaling so that it meets provincial requirements.
- Future work. The industry is interested in starting a large scale pilot project as soon as possible.

# Thank you

