3rd Regional Seminar on Weigh-in-Motion

Session 4A – Quality Improvement of WIM Data

Requirements for Updating the Truck Tractor (TT) WIM Calibration Method

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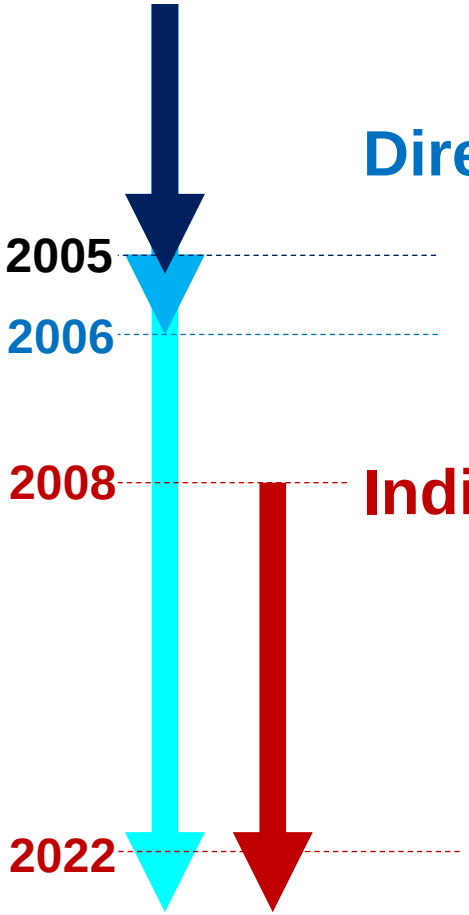
Presentation Outline

- Development History of the TT Method
- How the TT Method Works
- Accuracy of the TT Method
- Areas for Improvement

Development History



Direct Methods using Reference Vehicles

ASTM E1318-02 (American Standard) – up to 2005

COST 323 (European Standard) – 2006

Random Samples of Reference Vehicles – on-going

Indirect Method

Front-axle Truck-tractor Ratio (FTR) Method – 2008

FTR Method refined for SANRAL, became known as the Truck Tractor (TT) Method – 2008

Review of the TT Calibration Constant – underway

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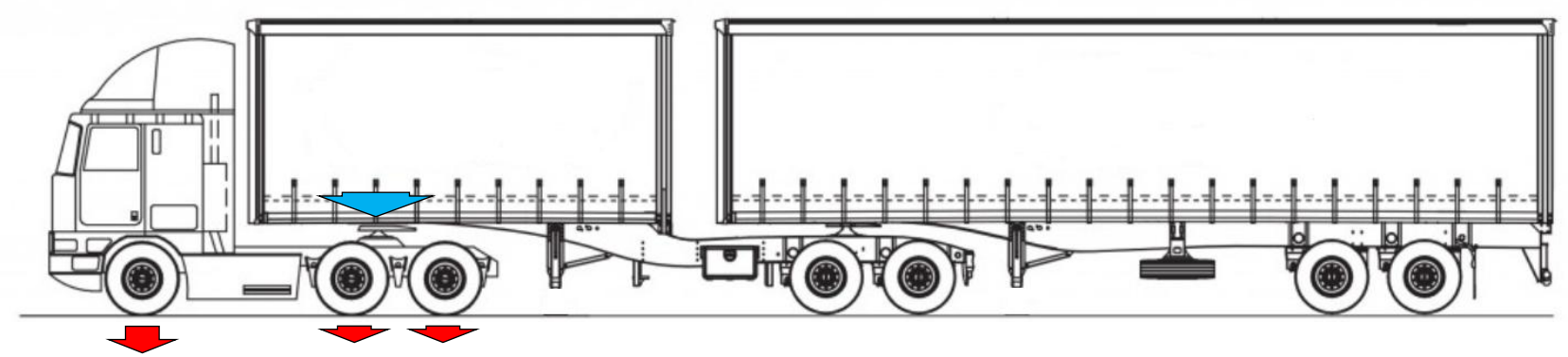
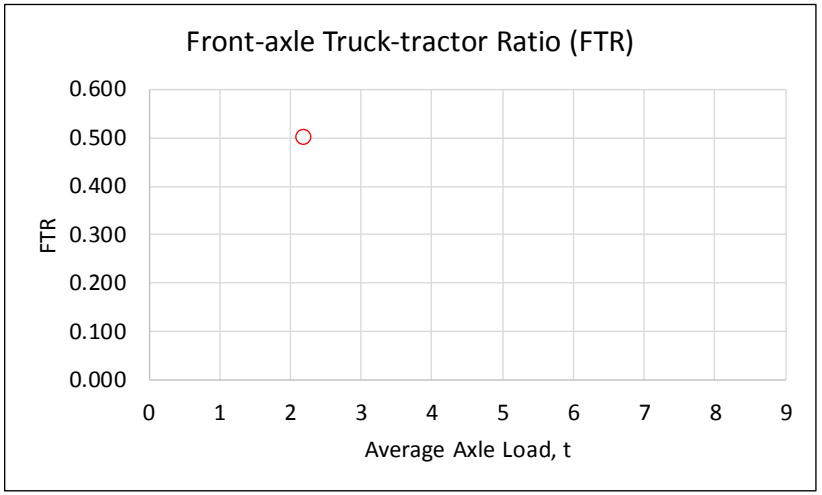
The Truck Tractor (TT) Method





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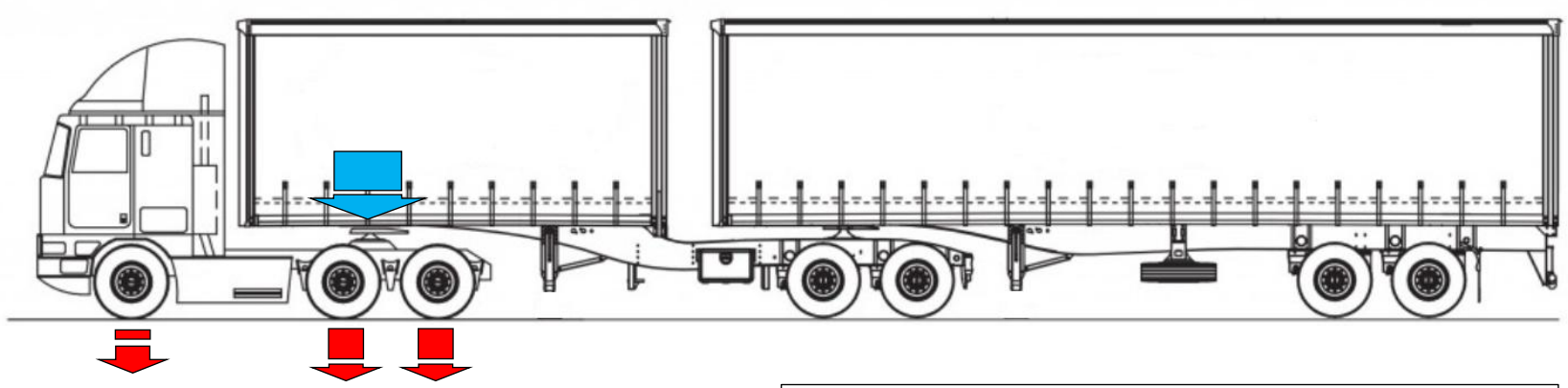
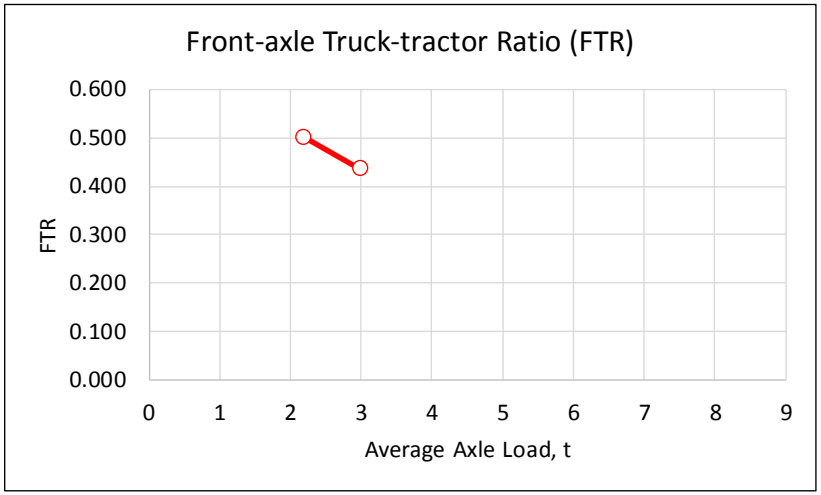
The Truck Tractor (TT) Method





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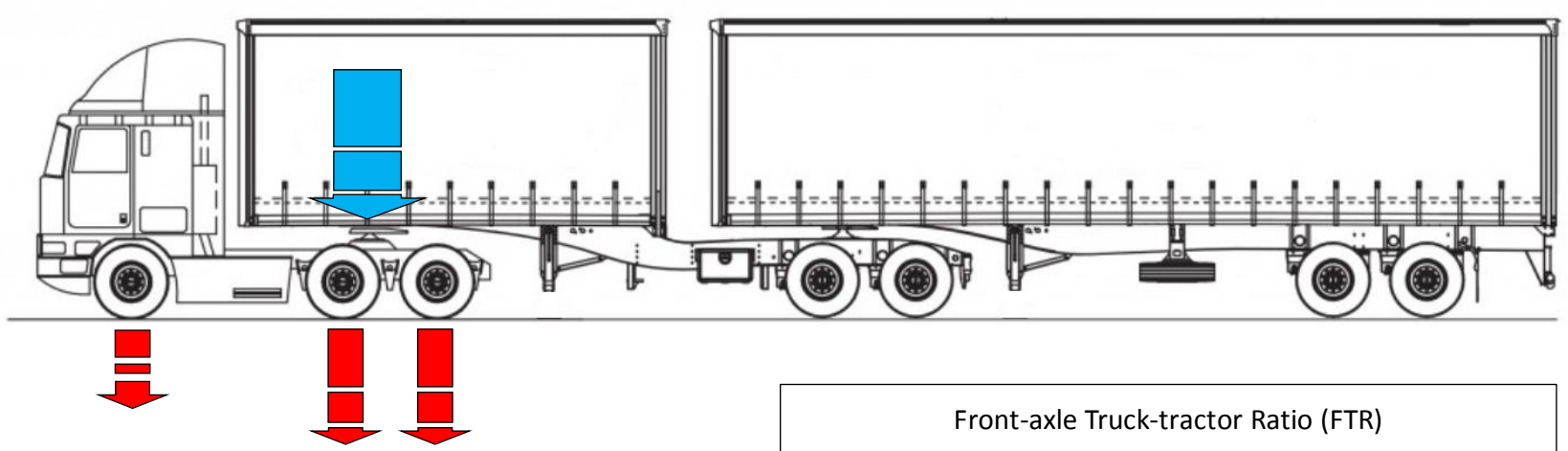
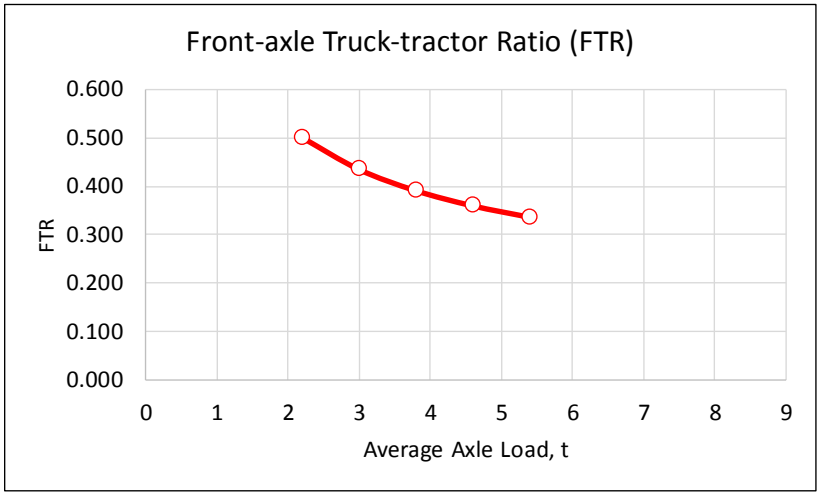
The Truck Tractor (TT) Method





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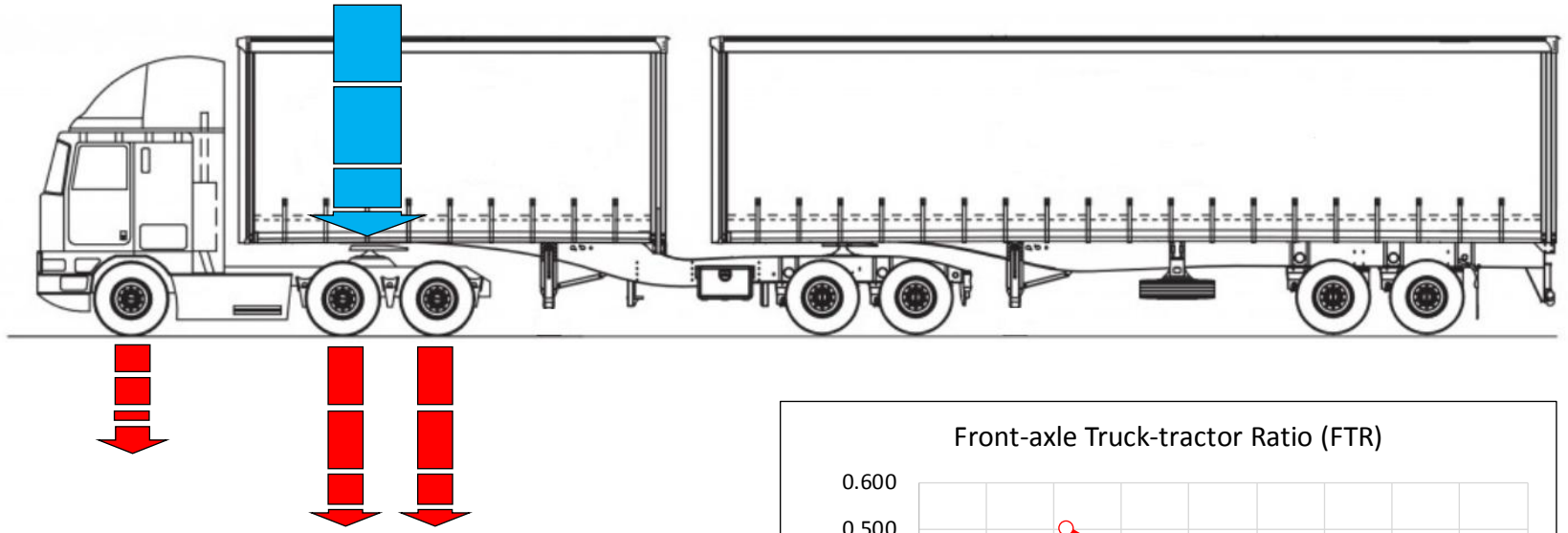
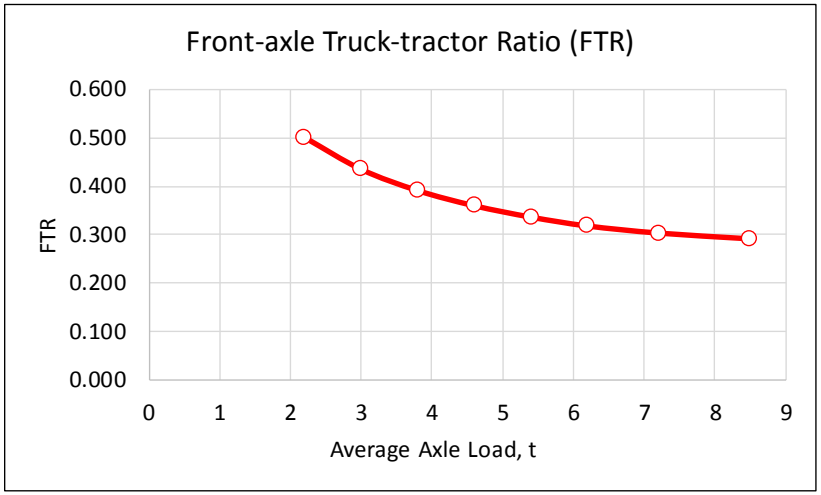
The Truck Tractor (TT) Method





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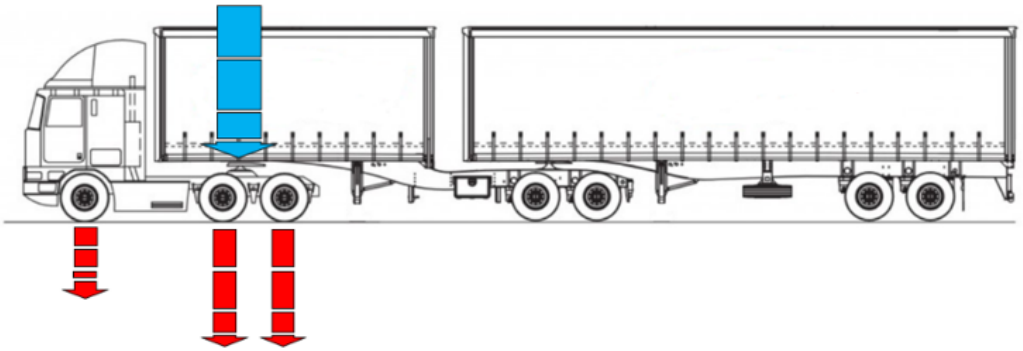
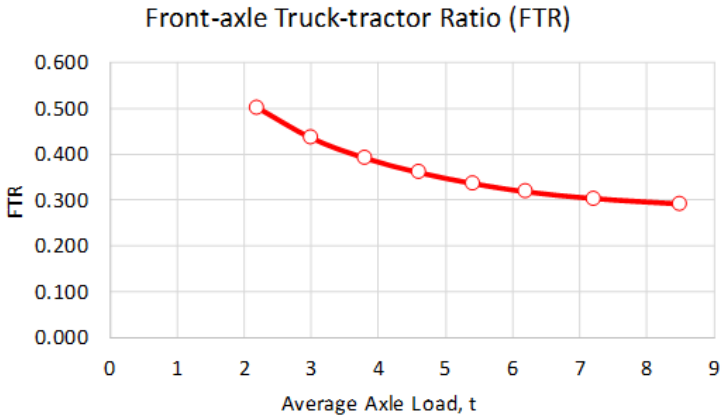
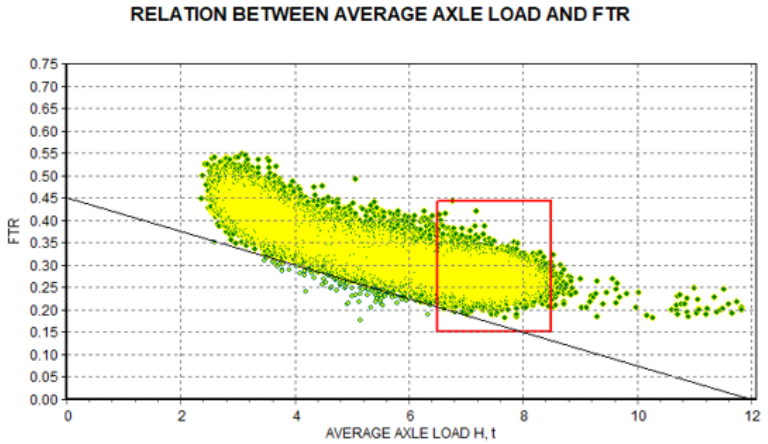
The (TT) Method – Banana Graph



Load transfer from trailers via kingpin onto truck tractor axles



FTR plot for incremental loading of a truck



FTR plot for WIM-recorded sample

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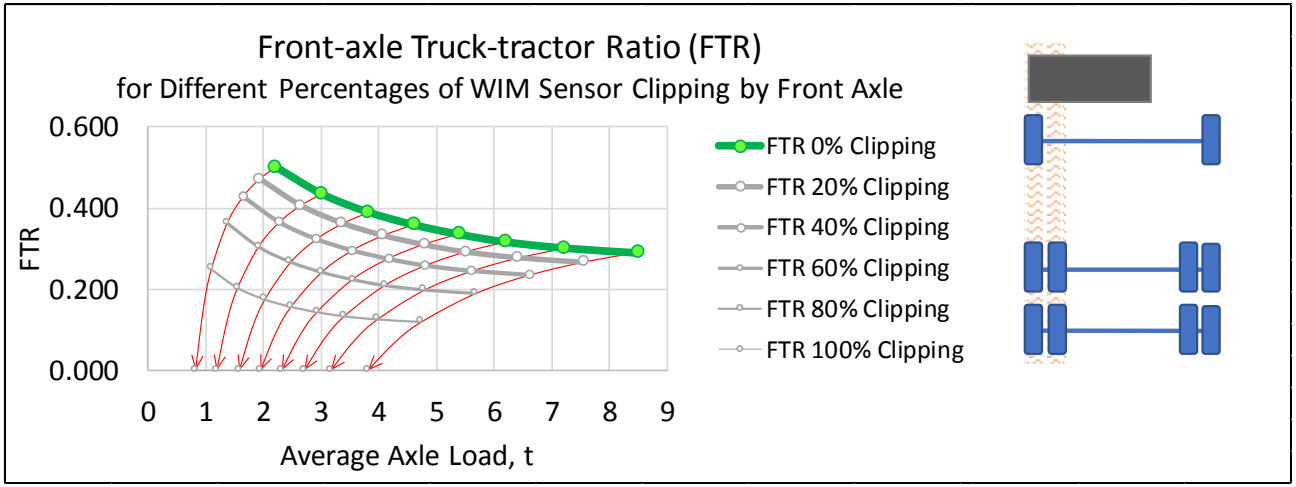
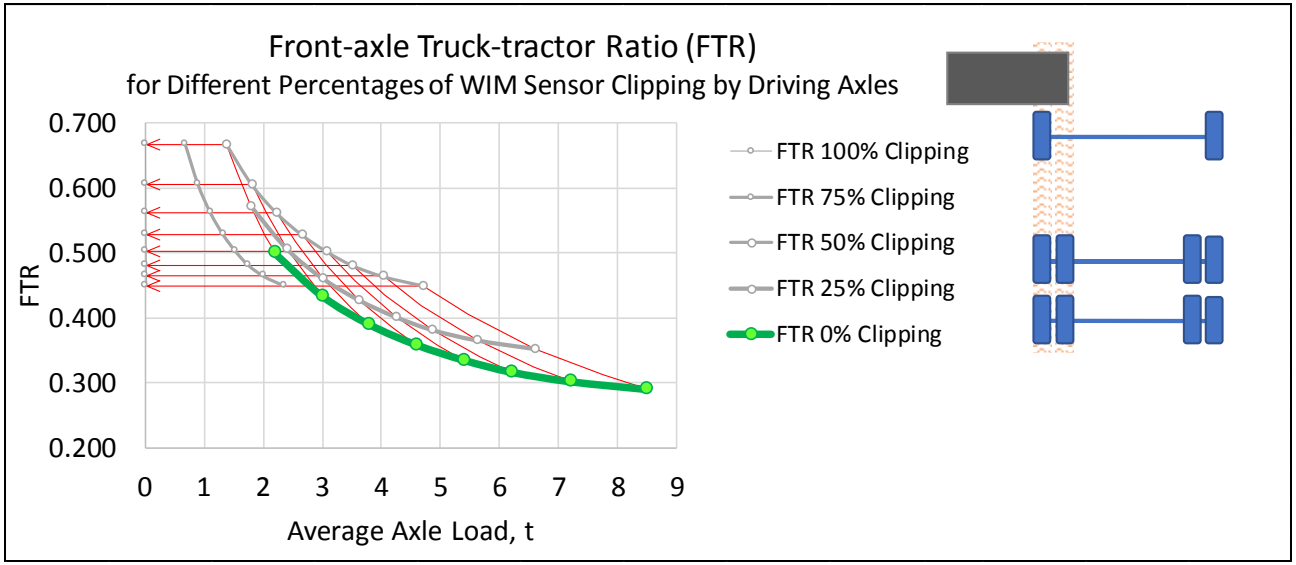
The TT Method – Sensor Clipping





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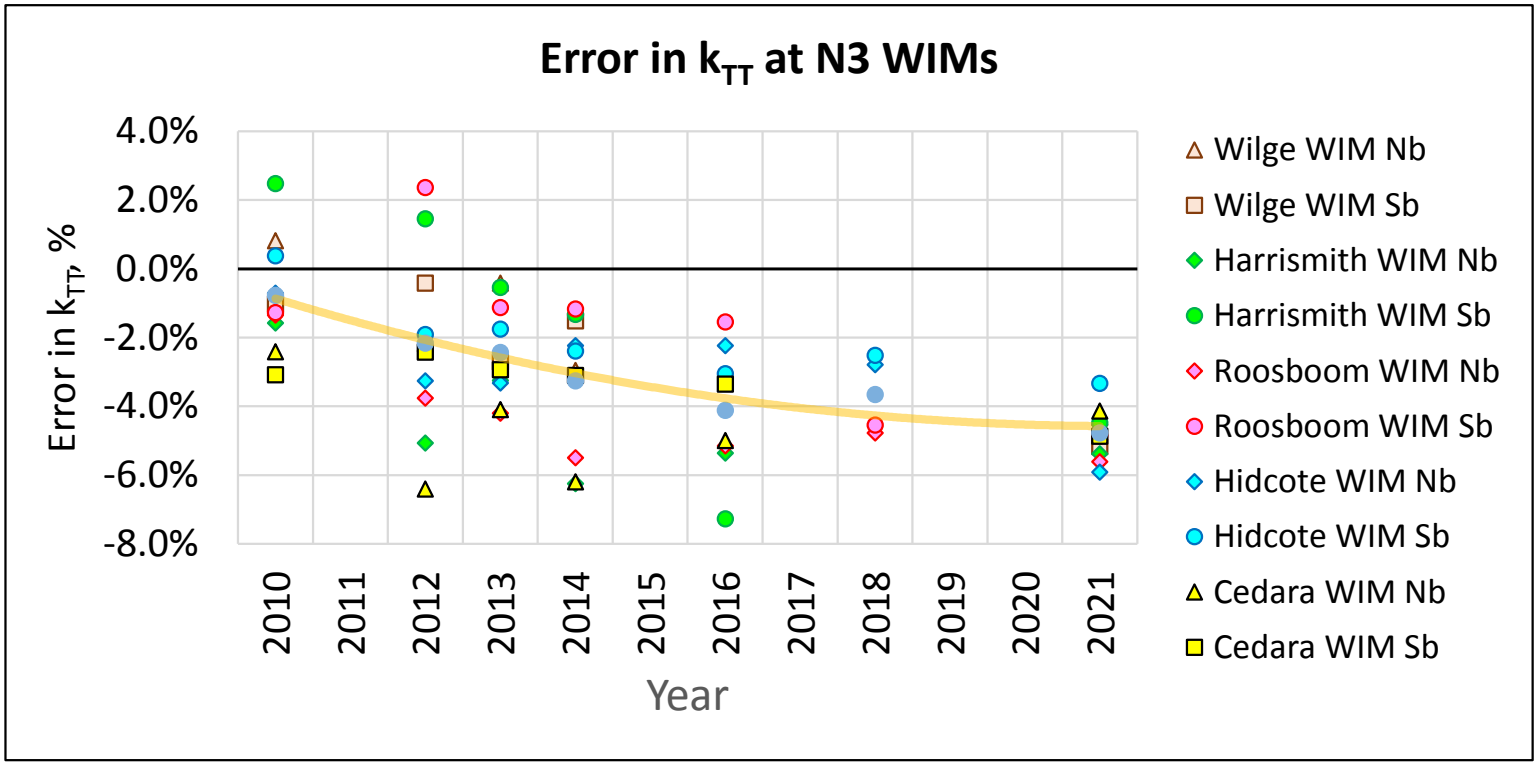
Long-Term Accuracy of TT Method

- N3 WIMs currently under-calibrated by TT Method, typically by between 4% and 6%



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Long-Term Accuracy of TT Method

- Initially accurate to within 1% on average on N4 East
- Now systematically under-calibrated by almost 4%

N4 East WIM Site	Error in k_{TT}	
	2006 - 2008	2018 - 2019
Mid-East Eb WIM	0.69%	-5.26%
Mid-West Wb WIM	0.40%	-5.59%
Farrefontein Eb WIM	0.74%	-3.15%
Machado Wb WIM	-2.36%	-3.50%
Komati Eb WIM	-2.82%	-4.05%
Komati Wb WIM	0.03%	-0.18%
Average	**-0.55%**	**-3.62%**

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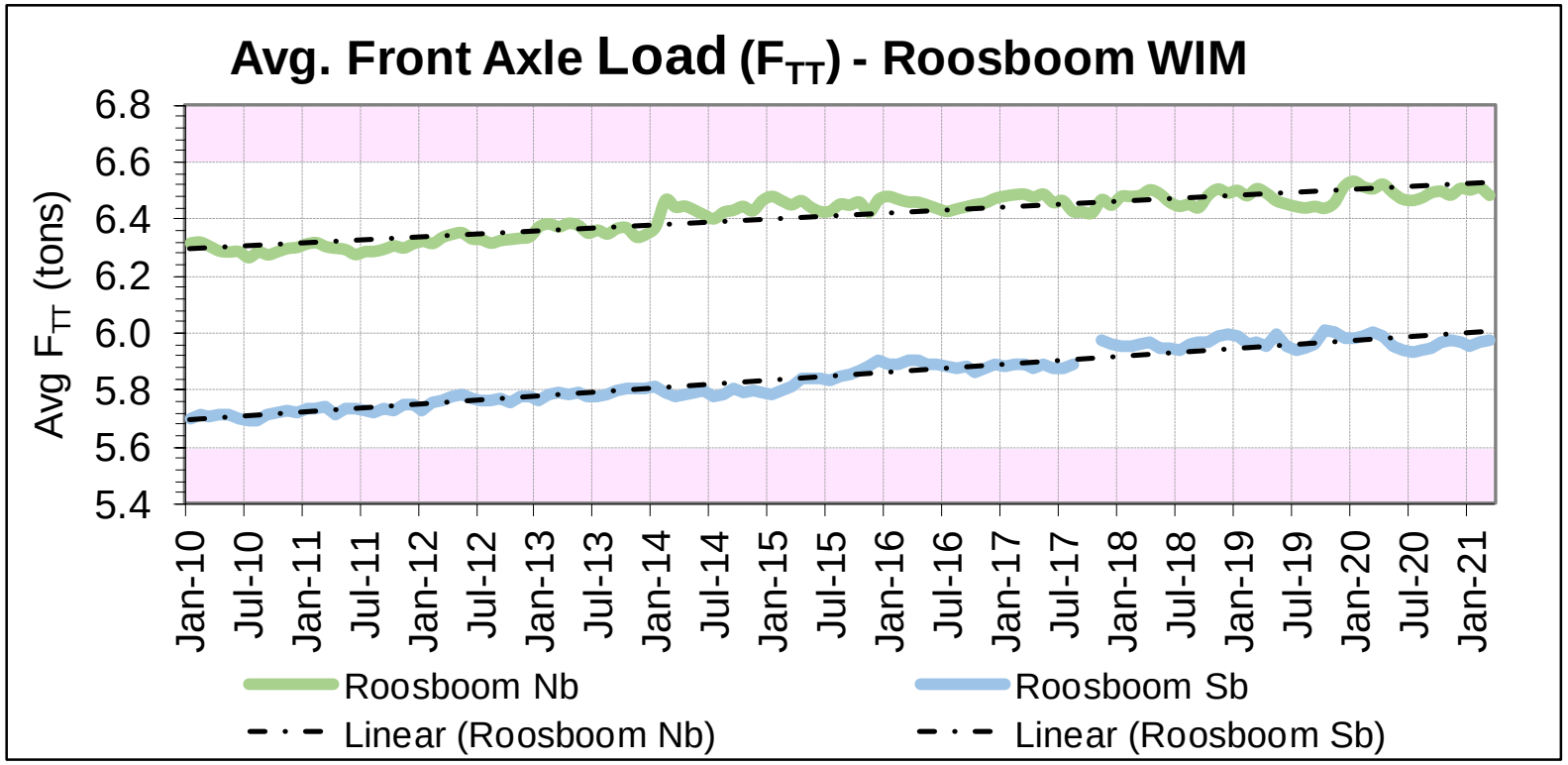
Change in Front Axle Load

- Avg Front Axle Load of TT Trucks increased by between 2 and 3%



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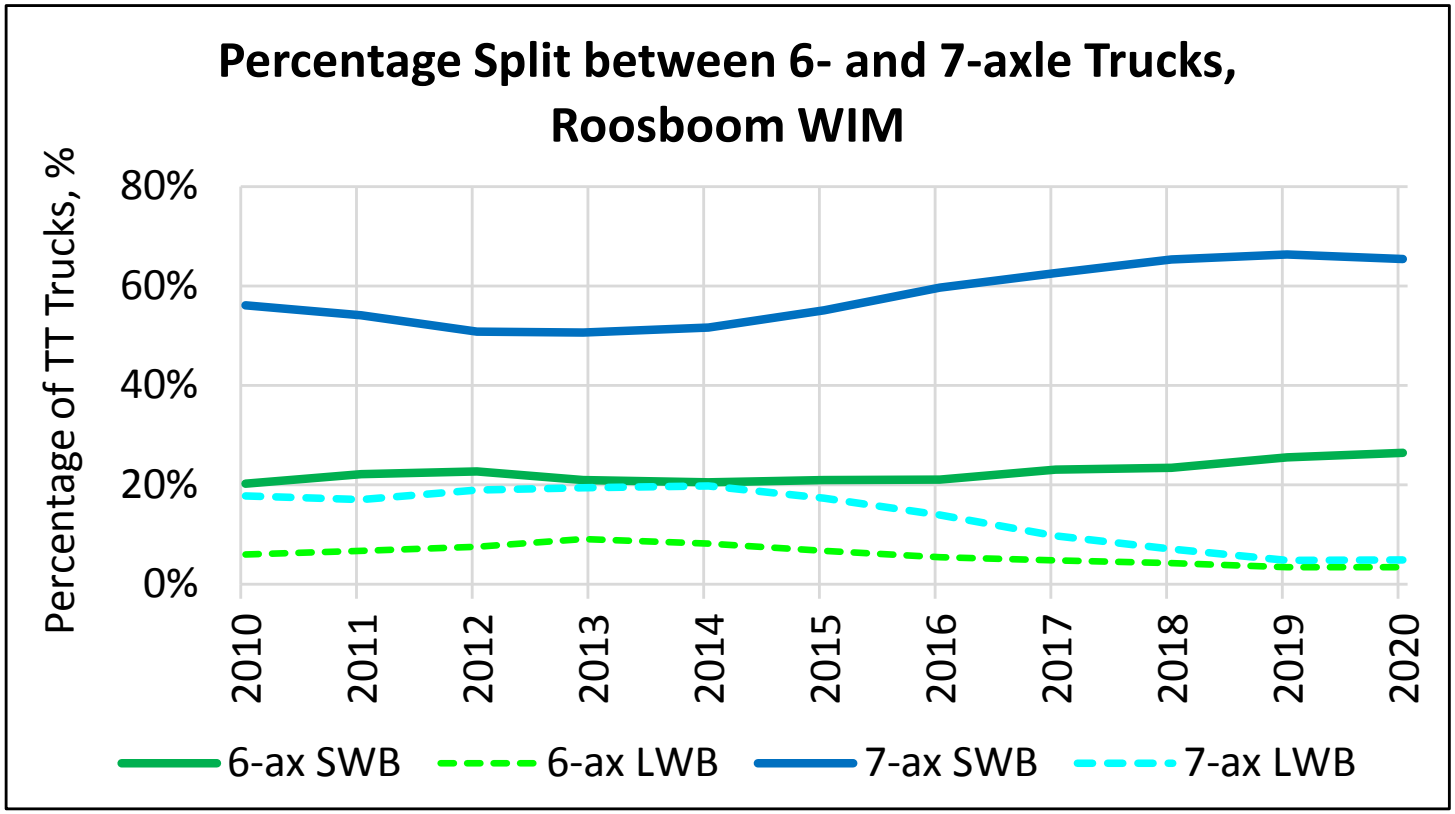
Percentage Split between 6- and 7-axle Trucks

- Reduction in Long Wheel Base (LWB) Trucks



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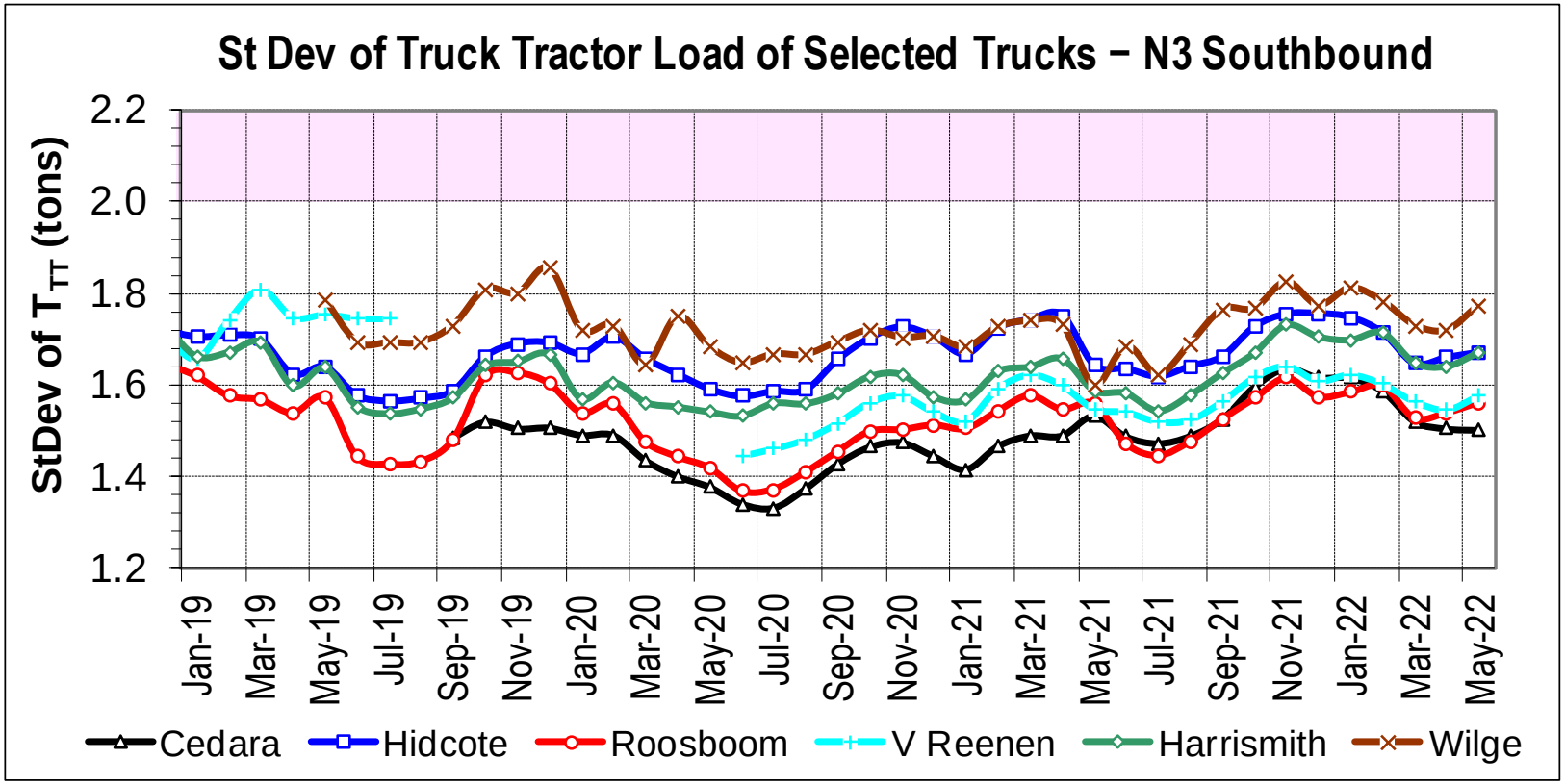
Quality Parameters Affected by More than just Quality

- N3 Sb WIMs' Quality indicators fluctuate together



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Requirements of New TT Target

- New TT Calibration Target should be a Variable Target:
  - Calculated from Universal or Non-dimensional markers in data
  - Account for vehicle composition and extent of loading
  - Consider 6- and 7-axles separately
  - Adjustment for one-sided vs full lane WIMs
  - Balance between Accuracy and Complexity

Developing a Variable TT Target

- Several combinations of Universal or Non-dimensional markers tested
- Prototype developed
- Testing of the accuracy of the new variable TT target and calibration factors
- Implementation of method into smGolem software for routine testing

The Way Forward

- Finalise Variable Target TT Method
- Back-process WIM data to confirm that it works for new and historic data and to confirm accuracy of calibration factors.
- Reprocess (reinterpret) WIM data for Concessionaires to redevelop trends and update loading projections
- Incorporate method into SANRAL Overload Software model for routine use.
- Integrate / align TT Method's data quality checks with WIM for Direct Enforcement (WIM-e)

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