



Performance
Innovation
Transport

Fuel Economy Testing of 6x2 Tractors



**Task Force on Vehicle
Weights and
Dimensions Policy**

**Government / Industry
Meeting**

November 20, 2013

Montreal



Introduction

6 x 2 Evaluation Project

■ Testing:

- During the 11th Energotest campaign (May 30 – June 5, 2013)
- At Transport Canada MVTC - PMG Technologies (Blainville)

■ Objective:

- Compare the fuel consumption and traction performances of 6 x 2 and 6 x 4 tractors



Test Vehicles

6 x 2 Modified from 6 x 4 Tractors

- Three 2012 Kenworth T660, ISX 450 HP, rear axle Dana Spicer D40-170P, 3.21 ratio:
 - Control vehicle 6 × 4
 - Test vehicle 6 × 2 Mod. 1: emptied rear housing, removed the drive shaft between front and rear housing, changed gears in the front housing
 - Test vehicle 6 × 2 Mod. 2: switched front and rear housing, emptied rear housing; gears not changed



Test Vehicles

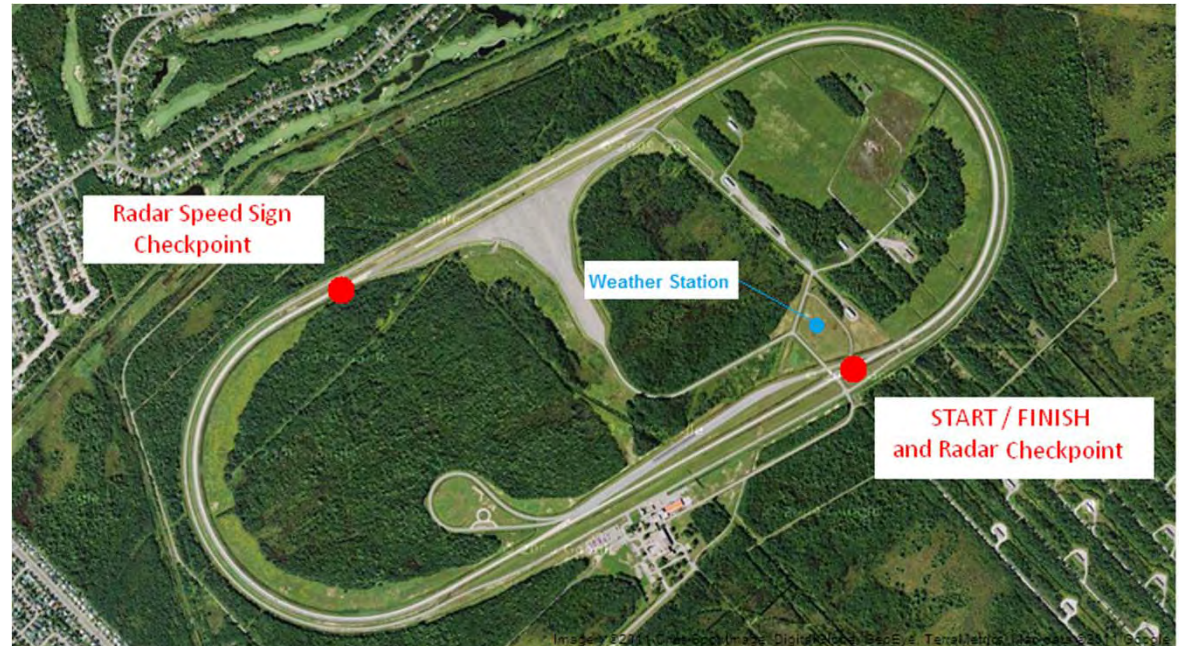
6 x 2 OEM Tractors

- Two 2013 Volvo VNL, D13 425 HP :
 - Test vehicle: 62T, 6 × 2, rear axle RS23-160/161 Meritor Plus Volvo Non-drive, 2.67 ratio
 - Control vehicle: 64T, 6 × 4, rear axle MT40-14XC Arvin Meritor, 2.64 ratio



Test Methodology

- Fuel consumption tests:
 - Volvo OEM 6 x 2 tractors: SAE J1526 Type III
 - Kenworth T660 modified 6 x 2 tractors: SAE J1321 Type II
- Pull sled test:
 - Compare the pulling distance, maximum speed, and acceleration when pulling the same set sled on similar surface



Test Results

Fuel Consumption Tests

- 2012 Kenworth T660 6 × 2 Mod. 1 (removed the drive shaft, change gears in the front housing):
 - Fuel savings: 2.57 % ± 2.04 %
 - Fuel improvement: 2.64 % ± 2.10 %
- 2012 Kenworth T660 6 × 2 Mod. 2 (removed the drive shaft, switched front and rear housings, emptied rear housing):
 - Fuel savings: 3.45 % ± 1.16 %
 - Fuel improvement: 3.57 % ± 1.20 %
- 2013 Volvo OEM 6 × 2 :
 - Fuel savings: 3.29 %
 - Fuel improvement: 3.40 %



Test Results

Pull Sled Tests

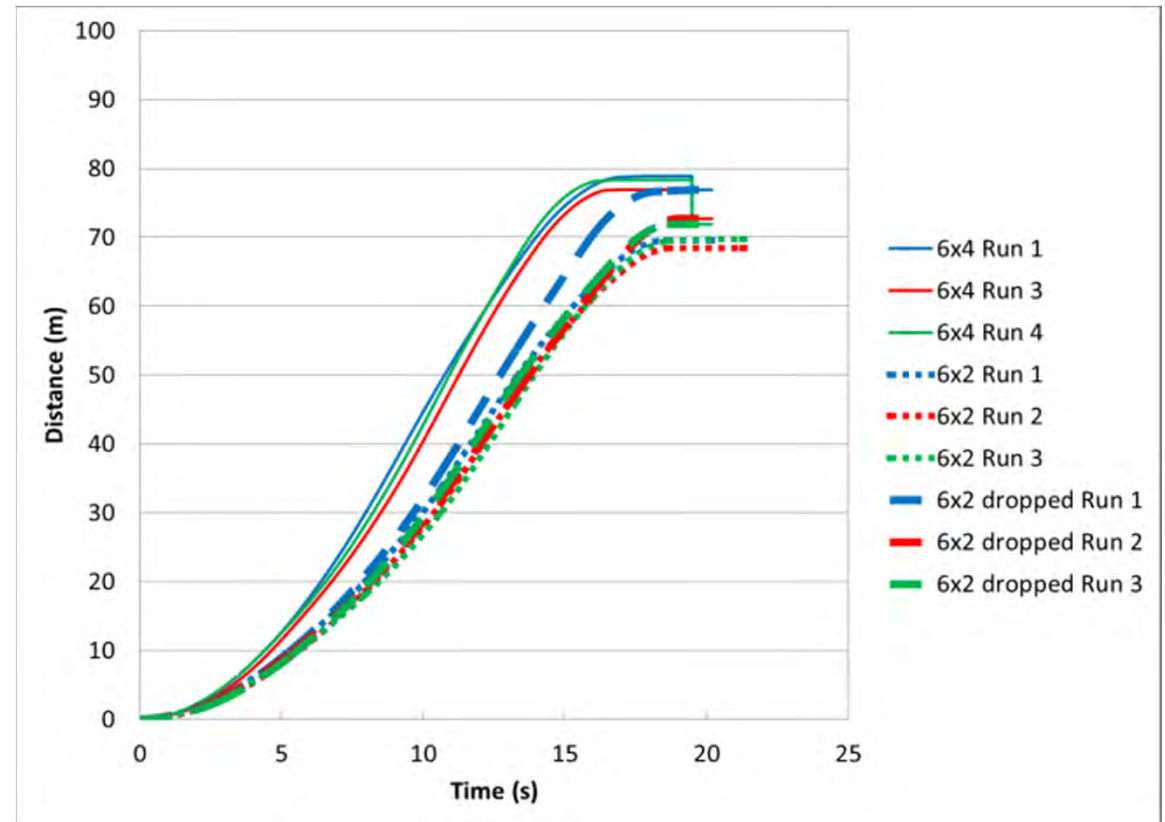
- Pull sled tests showed for the 6 × 2 tractors, compared to similar 6 × 4 tractors :
 - 5.4 to 13.5 % shorter distance
 - 17% lower maximum speed
 - 10.5 to 35 % worse acceleration



Test Results

Pull Sled Tests

- 6 x 2 tractors with rear axle load transferred to the front axle (the suspension dropped), the pulling distance was longer and the maximum acceleration was higher than with the load equally distributed



Conclusions

- The 6 × 2 tractors consume from 2.6 to 3.5% less than the similar 6 × 4 tractors
- Weight reduction advantage: the 6 × 2 OEM tractor was 380 kg lighter than the 6 × 4 OEM tractor
- Systems are available for transferring the load from the dead axle to the drive axle in special conditions for increasing the traction
- At virtually the same cost, the 6 × 2 tractors replacing 6 × 4 tractors could reduce annually the GHG emissions up to 1.93 tonnes per vehicle, and 193 000 tonnes nationally



Acknowledgments

- Member fleets of PIT
- Trans-West: provider of Kenworth tractors, and modifications of the rear drive axles
- NACFE: provider of Volvo tractors for testing, and technical input
- PMG Technologies, Natural Resources Canada and Transport Canada



Thank you for your time

Yves Provencher, ing.f., M.Sc.

Directeur / Director PIT

Yves.provencher@fpinnovations.ca

