CENTRE D'INNOVATION CENTRE

TIRE PRESSURE MONITORING SYSTEM (TPMS) & TELEMATICS

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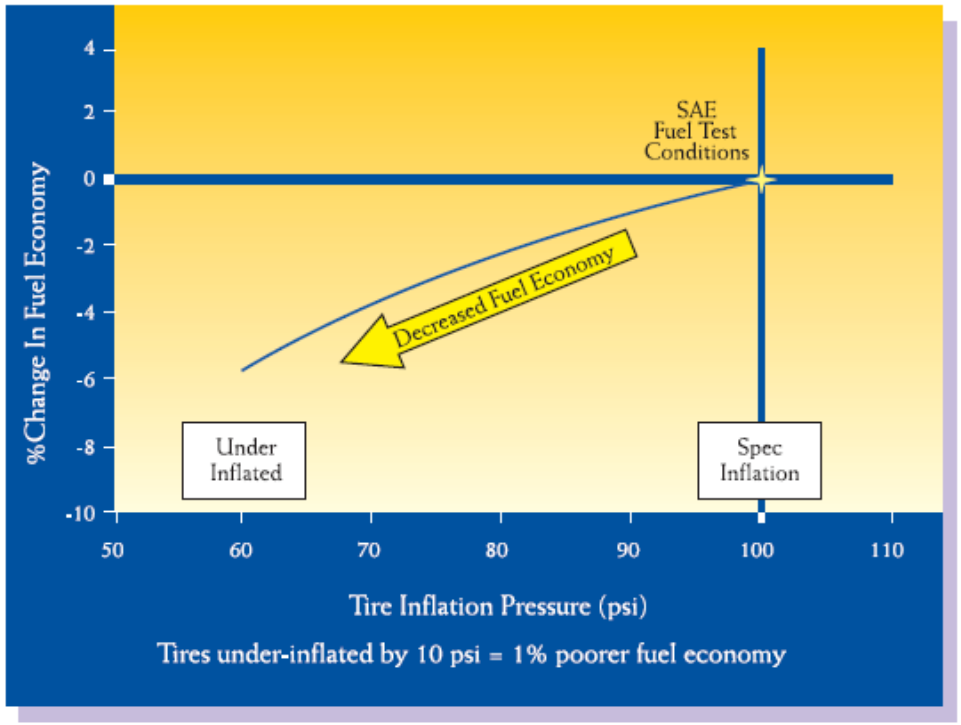
2020-11-16

Project Background

- Every 10 psi of under inflation results in 1% poorer fuel economy.
- Under-inflated tires experience high internal stresses with decreased fuel economy and higher heat buildup within the tires.
- Over-inflated tires can lead to vehicle instability and blowouts.
- About one out of five tractors/trucks is operating with one or more tires underinflated by at least 20 psi. [NACFE, 2020]
- About one in five trailers is operating with one or more tires underinflated by at least 20 psi. [NACFE, 2020]
- Many solutions for tire pressure monitoring / automatic tire inflation system (TPMS/ATIS) exist to monitor/manage tire pressure as preventative maintenance on commercial vehicles.
- The reliability of TPMS/ATIS solutions are unknown in Canadian conditions.



Source: Goodyear Computer Fuel Economy Model

Project Background

- *The publication of the proposed Phase 2 Amendments in the Canada Gazette, Part I, initiated a 75-day comment period where interested parties were invited to submit their written comments. During this period, owner and operator associations requested that ECCC take into account the suitability of certain vehicle technologies expected to be adopted to meet the Phase 2 standards in the context of Canadian operating conditions, including TPMS and ATIS.*
- *When the Phase 2 Amendments were finalized in the Canada Gazette, Part 2, ECCC responded that within the regulatory impact analysis of the Amendments, proportionally higher maintenance costs estimates relative to the U.S. were applied to all vehicle categories to account for the possibility of decreased reliability and durability of trucking equipment in Canadian climatic conditions*
- *As supplementary information, further study through a technology evaluation campaign will deliver valuable insights into payback times for owner/operators .*

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Regulations Amending the Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations and Other Regulations Made Under the Canadian Environmental Protection Act, 1999: SOR/2018-98

Canada Gazette, Part II, Volume 152, Number 11

Registration

May 16, 2018

CANADIAN ENVIRONMENTAL PROTECTION ACT, 1999

P.C. 2018-538 May 14, 2018

Whereas, pursuant to subsection 332(1) [a] of the *Canadian Environmental Protection Act, 1999* [b], the Minister of the Environment published in the *Canada Gazette*, Part I, on March 4, 2017, a copy of the proposed *Regulations Amending the Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations and Other Regulations Made Under the Canadian Environmental Protection Act, 1999*, substantially in the annexed form, and persons were given an opportunity to file comments with respect to the proposed Regulations or to file a notice of objection requesting that a board of review be established and stating the reasons for the objection;

Therefore, Her Excellency the Governor General in Council, on the recommendation of the Minister of the Environment, pursuant to sections 160 [c] and 162 of the *Canadian Environmental Protection Act, 1999* [b], makes the annexed *Regulations Amending the Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations and Other Regulations Made Under the Canadian Environmental Protection Act, 1999*.

Regulations Amending the Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations and Other Regulations Made Under the Canadian Environmental Protection Act, 1999

Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations

1 (1) The definitions *heavy-duty completed vehicle* and *vehicle service class* in subsection 1(1) of the *Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations* [1] are repealed.

(2) The definitions *A to B testing*, *CO_2 family certification level*, *engine configuration*, *engine family*, *family emission limit*, *heavy-duty incomplete vehicle*, *heavy heavy-duty vehicle*, *medium heavy-duty vehicle*, *model year* and *vehicle configuration* in subsection 1(1) of the Regulations are replaced by the following:

A to B testing means testing performed in pairs to allow comparison of a vehicle A to a vehicle B, an engine A to an engine B or equipment A to equipment B, as the case may be. (*essais A à B*)

CO_2 family certification level, in respect of a company's heavy-duty engines, means the maximum CO_2 emission level determined by the company for a fleet, which is greater than or equal to the maximum CO_2 deteriorated emission level value calculated in accordance with subsection 32(1) for the engines that are included in the fleet. (*niveau de certification de la famille applicable au CO_2*)

engine configuration means a unique combination of heavy-duty engine hardware and calibration that has an effect on measured emissions within an engine family. (*configuration de moteur*)

engine family, in respect of a company's heavy-duty engines other than those referred to in section 25, means

Previous Studies

- US DOT FMCSA 2007

Tire Pressure Monitoring and Maintenance Systems Performance Report

- NACFE Confidence Report 2013

Report of a study conducted by the North American Council for Freight Efficiency on the Confidence of Adopting Tire Pressure Systems

- US DOT FMCSA 2014

Advanced Sensors and Applications: Commercial Motor Vehicle Tire Pressure Monitoring and Maintenance
https://rosap.ntl.bts.gov/view/dot/178

Fleet results from 2014 US DOT report

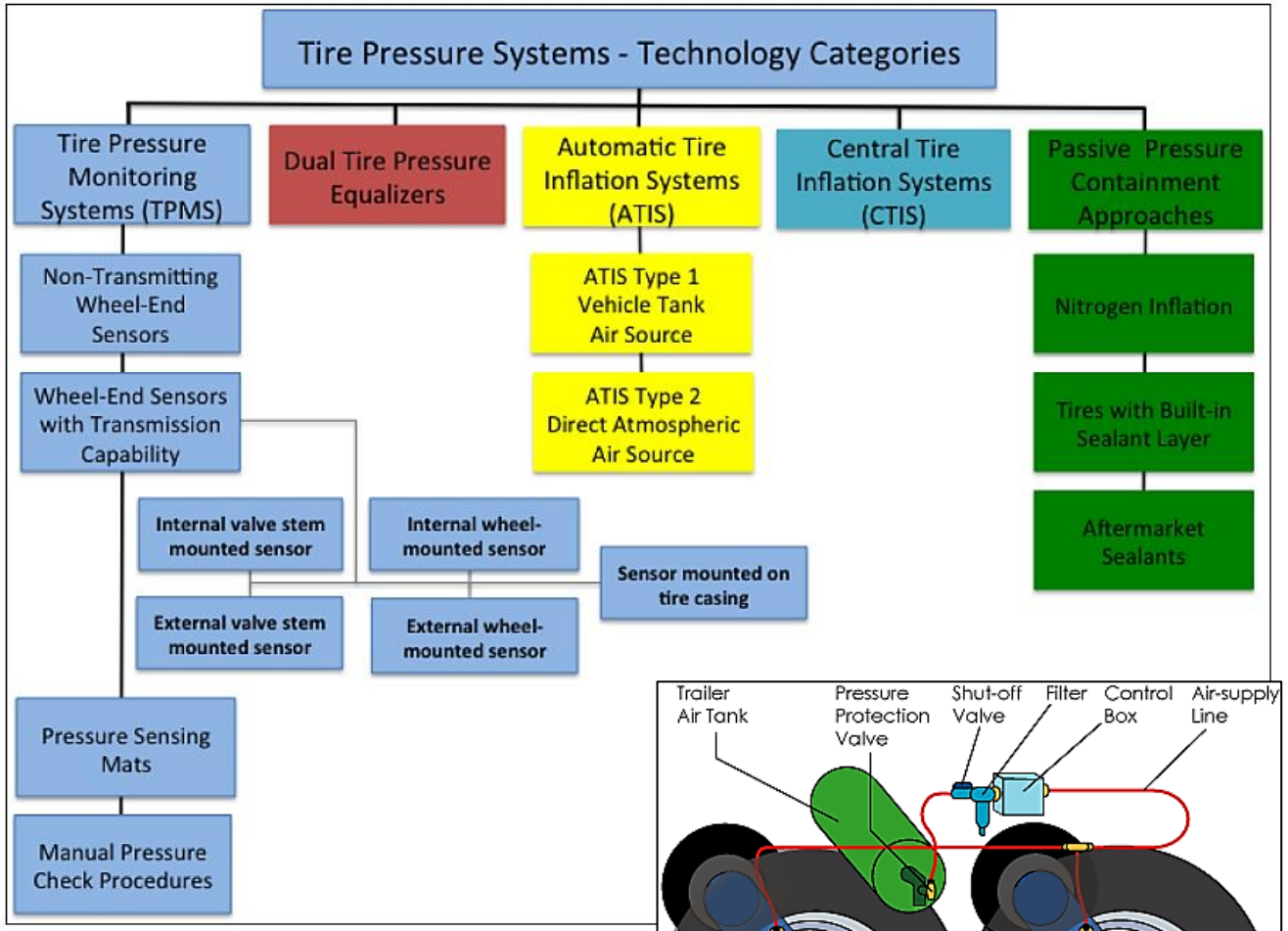
No.	Hypothesis	Analysis	CLI	GFS
1	The use of TPMS and ATIS will increase the life of TPMS/ATIS-equipped tires.	Analyze tread wear per mile. Analyze based on tire location (steer, drive, trailer).	Valid	Inconclusive
2	The use of TPMS and ATIS will reduce the fuel consumption of equipped tractor-trailers.	Analyze average miles per gallon (mi/gal).	Valid	Valid
3	The use of TPMS and ATIS will reduce road calls for damaged/flat tires for equipped tractor-trailers.	Analyze overall road calls. Analyze tire failures.	Inconclusive	Valid
4	TPMS and ATIS will accurately display the tire pressure of equipped tractor-trailers at the driver interface.	Analyze accuracy of equipment.	Inconclusive	Inconclusive
5	TPMS and ATIS will not introduce unscheduled maintenance that will affect the day-to-day fleet operations.	Analyze unscheduled maintenance actions.	Valid	Valid

CLI Transport: https://www.linkedin.com/company/cli-transport-lp/
Gordon Food Service: https://www.gfs.ca/en-ca

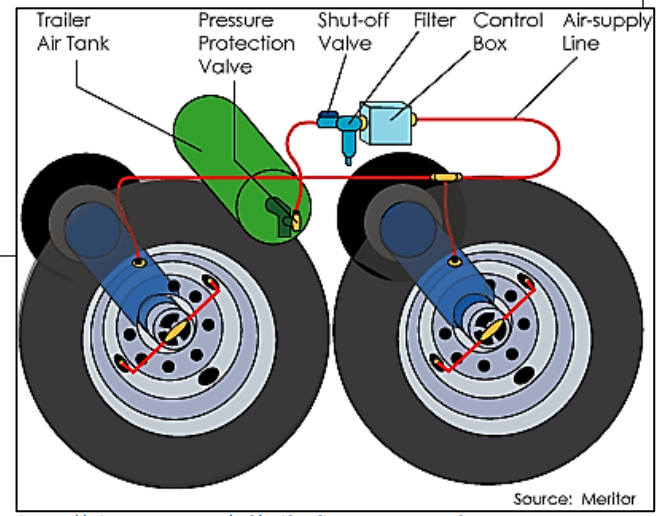
Technology Background

- Multiple approaches exist to manage tire air leakage.
- Of interest include TPMS & ATIS.
- Benefits include: fuel savings, increased tread life, and improved safety.
- Challenges include: driver training, additional maintenance, and air leaks.

https://a57.foxnews.com/static.foxnews.com/foxnews.com/content/uploads/2018/09/640/320/halo-tire.jpg?ve=1&tl=1



https://nacfe.org/technology/tire-pressure-inflation-systems-trailers/



https://s.hswstatic.com/gif/self-inflating-tire-15.gif

Technology Solutions

Stemco - AirBat/RF®

Tractor Interface Module - TIM

PressurePro - PressurePro™

Continental - ContiPressureCheck™

Stemco - AERIS®

Aeris - Automatic Tire Inflation System

Doran - Doran 360HD™

Hendrickson - TIREMAAX® PRO

Dual Dynamics - Crossfire Dual™

1 .Courtesy: PIT Group

Project Partners

- Partners include:
  PIT Group, National Research Council (NRC).
  - The PIT Group has selected TRANS WEST as the candidate fleet
  - The PIT Group has selected ContiPressureCheck™ (TPMS) as the test system
- Project drivers include:
  - *Natural Resources Canada's Green Freight Assessment Program*
  - *Natural Resources Canada's FleetSmart Program*
  - *Canadian SmartWay Program*
  - *Environment Canada's Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations*

Transport Canada Transports Canada

NRC·CNRC

PIT Group FPInnovations

Project Outline

Phase I – Test Plan Development

- Market reviews (PIT), draft ROI calculator (PIT) & program test plan development (NRC)

Phase II – Testing of a TPMS / Telematics package

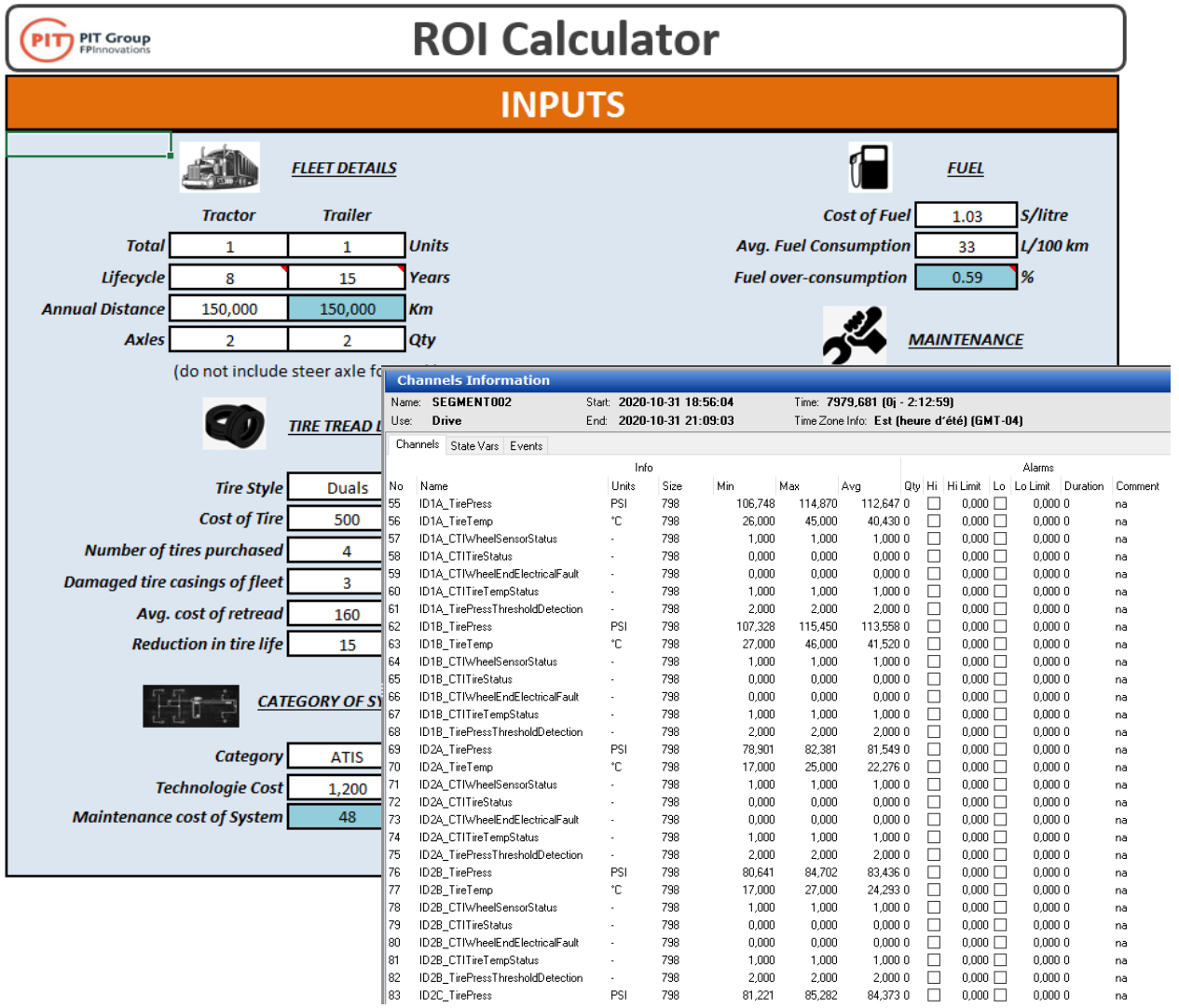
- Objectives are to evaluate how second generation TPMS systems impact tire tread wear, maintenance, downtime/operations, and safety.
- The project will assess how accurate & reliable the systems are on a long term basis, and how their performance is affected by Canadian environmental conditions (cold ambient temperatures, salt corrosion).
- Finally, the project will calculate the potential return on investment (ROI) for fleets, and will inform the development of the FP Innovations' PIT group ROI calculator.

1. Courtesy: images.tc.gc.ca

*Second generation TPMS systems are those with integrated telematics capabilities.

Current Progress

- Phase 1 market reviews, and TPMS/Telematics test plan is complete.
- 7 Class 8 tractors have been equipped with TPMS/Telematics technology & new tires. Truck driver's and the PIT Group will be collecting data to evaluate their performance through 2021
- 9-month test campaign beginning December 2020. , ± 3 millions KM
- 7 test trucks, 3 control trucks
- Montreal to California / West Coast Routes (extreme temperature variations), pressures will be checked manually at pickup and destination
- ISAAC Instruments telematics integration
- Reporting will be done by the National Research Council in FY2021.



CENTRE D'INNOVATION CENTRE

Transports Canada Transport Canada

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http://www.tc.gc.ca/en/initiatives/innovation-centre.html