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Fuel efficiency testing at FPInnovations

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W&D Task Force
November 22. 2010

Presentation

1. **Overview - FPInnovations**
2. **PIT Concept**
3. **Energotest™**
4. **Technologies and methods tested**
5. **Results**
6. **Real life tests**
7. **Proposed project**

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Overview - FPInnovations

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- **Largest forest products research institute in the world**
- **More than 600 employees across Canada**
- **Budget : $100 million/yr**
- **Our business is implementing practical research solutions**

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FPInnovations works towards optimizing the forest sector value chain. It capitalizes on Canada's fibre attributes and it develops new products and market opportunities within a framework of environmental sustainability.

OUR DIVISIONS

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PIT Concept

PIT FPInnovations

How PIT works?

- Partners pool resources to increase R&D impact
- Financing
  - Contribution of the fleets
  - Government
- Orientation of the research
  - Advisory committee once or twice a year
- The research is conducted on the vehicles of our partners. with their staff
- The results are quickly distributed to the members

Benefits for participating fleets

- Access to several hundreds of thousands of R&D dollars for a nominal cost
- Exclusive access to our team of experts for customized advice
- Positive visibility in the eyes of your clients and employees
- Increased support from suppliers as a result of FPInnovations involvement
- Guarantee of technology implementation for maximum ROI

Industrial partners

Many configurations are part of PIT






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EnergoTest™/MC

PIT FPInnovations

EnergoTest™/MC

Context

- FPInnovations was appointed in 2007 as an unbiased 3rd party. to manage the scientific side and to broadcast the results of a project involving Robert Transport. Cascades Transport. Transport Canada and the CTA (Canadian Trucking Alliance)
- Objective: Evaluate. in an accelerated manner. potentially energy-efficient technologies

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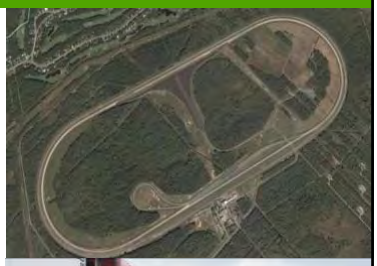
Basics

- Tests conducted at Transport Canada's motor vehicle test centre in Blainville QC
- Track layout:
  - **Oval 6.4 and 6.9 km**
- 2 types : high speed and urban cycles
- Run in cooperation with PIT members
- Based on:
  - **SAE J1321 Joint TMC/SAE Fuel Consumption Test Procedure – Type II**
  - **SAE J1526 Joint TMC/SAE Fuel Consumption Test Procedure - Type III**



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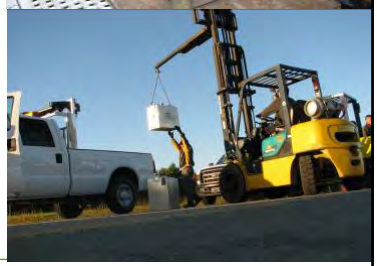
Methodology – SAE/TMC

- 2 steps
  - Base line: all the unmodified vehicles: reference test
  - Technology tests: the base line vehicles modified with the technologies to be validated
- Measurement of fuel consumption is accomplished by using the gravimetric method
- 3 homogeneous test
- Minimal impact of the driver and the weather condition



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EnergoTest

High speed test

- **Conducted at constant speed of 98 km**
- **All test segments are at a distance of 100 km**
- **Targeted for:**
  - Aerodynamic devices
  - Rolling resistance technologies
  - Technologies suitable for long haul and urban transport

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EnergoTest

Urban duty cycle test

- **Stop'n'Go test cycle**
- **Conducted with variable speeds and with frequent stops**
- **Procedures to simulate the following cycles**
  - Frequent stops (Bus. garbage trucks)
  - Pick-up and delivery in an urban or regional zone
- **Targeted for:**
  - Rolling resistance technologies
  - Technologies suitable for regional and urban transport

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EnergoTest

Summary to date

2007 :

- 19 technologies and in-house tests

2008 :

- 25 technologies & in-house tests

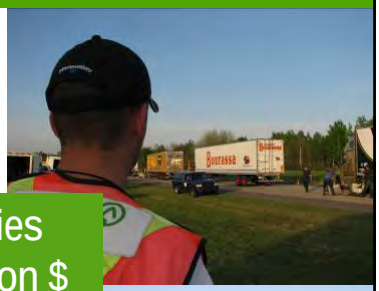
2009

- 2
- 4

2010

- Urban cycle : 5 technologies & in-house tests
- High speed : 15 technologies & in-house tests

More than 115 technologies tested. more than 1.5 million $ invested!



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Technologies and methods tested

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Aerodynamic skirts for trailer
Side tarp system
Side tarp system
Fenders for tractor


Wide base tires
85 psi vs 100 psi
Low rolling resistance tires
Active wheel balancing device


Flatbed semi-trailer with aerodynamic underbody 53'
Composite box
Hybrid truck


Diesel fuel and oil additives
Hydrogen fuel injection
Combustion enhancer
Mufflers

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Results

EnergoTest™/MC

EnergoTest™/MC

Results – Boat tails

Technology	Economy (%)
Rigid Boat Tail (0.6 m long + clearance regs)	1.5
Rigid Boat Tail (0.6 m long)	2.6
Rigid Boat Tail (1.25 m long)	5.1
Flexible Boat Tail (1.25 m long)	0.3

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Results – Trailer skirts

Technology	Economy (%)
Trailer skirts – Supplier A – Model 1	1.9
Trailer skirts – Supplier A – Model 2	3.9
Trailer skirts – Supplier A – Model 3	7.5
Trailer skirts – Supplier B	7.4
Trailer skirts – Supplier C	6.8
Trailer skirts – Supplier D	5.1
Trailer skirts – Supplier E	3.4
Trailer skirts – Supplier F	0.4

Results – Tires

Technology	Economy (%)
Wide base tires: XDA & XTA 445/50 R22.5 vs. XDN2 & XZE 275/80 R22.5	9.8
Continental HDL ECO plus 275/80 R22.5 vs. Michelin XDA-HT 275/80 R22.5	2.4
Continental HDL ECO plus 275/80 R22.5 vs. Bridgestone M726 EL 295/75 R22.5	1.4
Dunlop 11R22.5 SP384 FM, SP456 FM, and SP193 FM vs. Yokohama 11R22.5 101 ZL, 703 ZL, and RY587	1.3
Tire pressure: 85 PSI vs. 100 PSI	-3.1

Results – Various

Technology	Economy (%)
B-Train 3 axles up vs. all axles down	4.8
LCV vs. Tandem axle semi-trailer	31.4
LCV vs. Quad axle semi-trailer	-8.0
Close following	8.0
Speed 92 km/h vs. 98 km/h	5.1
Pilot pick-up signalling arrows - low profile vs, high	5.4

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PIT Test

Pilot pick-up signalling system (MTQ-CGER): raised versus hidden

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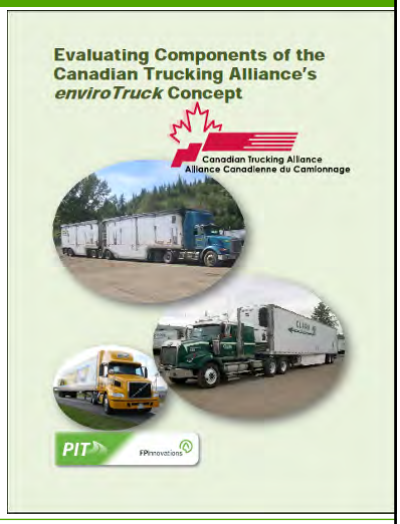
Real life tests

Real life results

- **Evaluation of the CTA enviroTruck concept**
- **Funded by TC ecoFreight Program**
- **Long term observational observation with control and test trucks on same routes**
- **Three segments planned:**
  - Clark Freightways
  - Excel Transport
  - Transport Robert



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Clark Freightways enviroTruck

- **LTL operation**
- **Vehicle equipped with a combination of:**
  - Low rolling resistance tires
  - Speed limiters
  - Trailer side skirts
- **Baseline: Oct. 2008 to April 2009**
- **Test period: April 2009 to Oct. 2009**

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Excel Transport enviroTruck

- **Bulk forest products haul operation**
- **2 Chip B-trains equipped with single wide base tires**
- **Baseline: July 2008 to Nov. 2008**
- **Test period: Nov. 2008 to Sept. 2009**

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Project proposal

Problematic

- **What is the relationship between road roughness and fuel consumption and vehicle maintenance?**
- **Objective: Increased information on when to rehabilitate roads**
- **FPInnovations has heard of interest from several provinces:**
  - Saskatchewan
  - Ontario
  - Quebec
- **Subject brought up at NACFE**
- **U. Laval PhD student**

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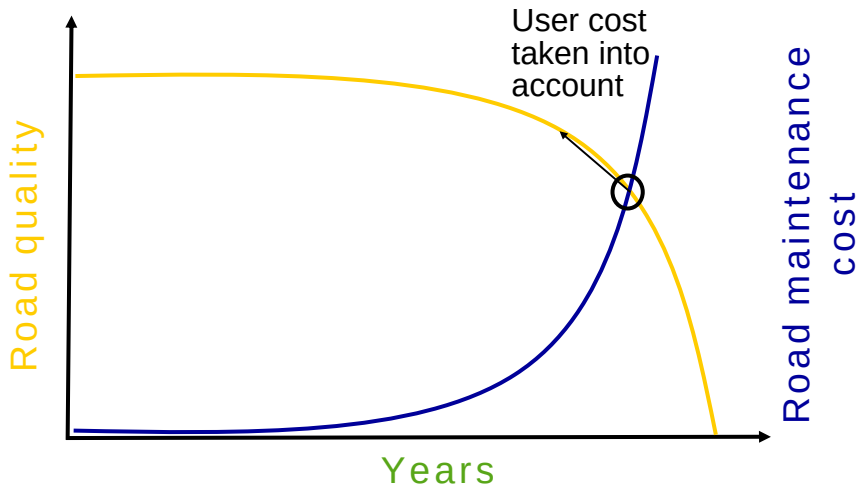
Timing of road rehabilitation



Project proposal

- **Very little literature on the road roughness and fuel consumption**
- **Some information on effect on vehicle maintenance**
- **Proposed project:**
  - Literature search
  - Development of test methodology
  - Testing
  - Development of model
  - Model validation
  - Development of decision tool
- **Funding?**
  - Best approach would be to form a research consortium
  - FPInnovations, U. Laval, Provinces, TC, CTA, others

What is interest?

- **Is this a project of interest to your province or organization?**
- **Would you be willing to provide funding?**
- **Should this go through TAC or another organization?**

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QUESTIONS?

Thank you

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