# Competency 2

**Energy Savings**

**Lesson Objective:**
- Recognize the different elements and technologies that influence energy consumption.
- Interpret data from an on-board computer in relation to fuel consumption.

## USING HEAVY VEHICLES ECONOMICALLY:



## DO YOU KNOW?

19% of greenhouse gas emissions come from heavy vehicles.

For every liter of diesel burned, 2.8 kg of carbon dioxide is released into the atmosphere.

Exhaust gases cause a lot of smog.

The particles emitted are potentially carcinogenic.

Fuel costs are the second largest operating expenses related to fleet operations (after labor costs).

Several accessories are available to reduce fuel consumption.

Several mechanical improvements have been made in recent years.

Some companies offer **Bonus Programs** for fuel-efficient drivers.

**SOME EQUIPMENT DESIGNED TO REDUCE FUEL CONSUMPTION:**

**Wide tread tires:** Savings up to 5% (Rolling resistance) About 400 kg less for a 5-axle tractor semi-trailer combination.

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**Tire pressure monitoring system (TPMS).**
**6 x 2 tractor (only one traction axle).**

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**Deflector for drive axles**
**Wheel covers**
**Mesh fenders:** Savings over 2%

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**Side skirts**
**Rear deflector for tractors and semi-trailer:** Savings of up to 5%
**Use of load-bearing axles**

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 **Different electronic tools example:** (Coach ISAAC)

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**MECHANICAL IMPROVEMENTS:**

Lowered cruising engine speed closer to engine torque
        Predictive cruise control
Idle management system for extended stops

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Checking the gap between the tractor and semi-trailer.

**(2.2.8)**

Use of more efficient lubricants.
Better controls for the alignment of the wheels of the equipment.

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## DID YOU KNOW?

Despite all the improvements featured, the driver remains the most important of all factors in fuel economy.

Up to **25 %** improvement by adopting **good driving habits.**

## BEHAVIOR HABITS TO ADOPT:

**Avoid unnecessary idling:** An idling engine consumes around 4 liters/hour. One hour of idling for an engine is equivalent to two hours of wear at cruising speed.

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## SOLUTIONS:

Warm up the engine by moving slowly and gradually until the engine operating **temperature** is reached.

Turn off the engine during basic maneuvers: (Circle Check, coupling/uncoupling, storage, etc.).

Turn off the engine during waiting periods: (customers, customs, fueling, etc.).

Go through the last few minutes of a trip without **applying load** to the engine, to allow it to cool down. Thus, it will be possible to switch off the engine as soon as the parking brake is applied.

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## SOME NUMBERS!
**One hour of unnecessary idling per day:**

4 liters of fuel/day

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250 working days/year
1000 liters/day
1000 liters at $1.40 = $1 400/year

**For a fleet of 100 trucks,**
100 trucks x $1 400 = **$140 000/year**

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## BEHAVIOR HABITS TO ADOPT:

Knowing the mechanical specifications of your vehicle.

Use of engine torque.

Using the gauges and fuel consumption data in the dashboard.
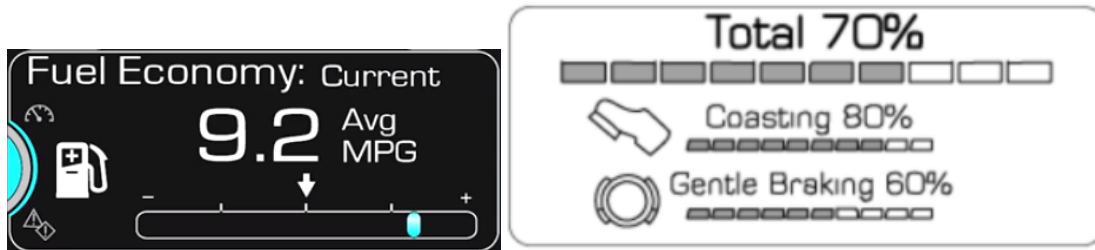
Progressive gear changes.

Anticipation to road changes and situations.

Lowering cruising speed.

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## RELEVANT DATA PROVIDED BY THE DASHBOARD:



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## USE OF AN "AUXILIARY POWER UNIT" DIESEL AND/OR ELECTRICAL. SUCH EQUIPMENT IS OPTIONAL BY ORIGINAL EQUIPMENT MANUFACTURERS OR AFTERMARKET SECONDARY MARKET MANUFACTURERS.

These units dramatically reduce extended idle times.

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**ALTERNATIVE ENERGY VEHICLES:**

Electricity using hydrogen
**NICOLA ONE; NICOLA TWO**

100% electric
**VOLVO ELECTRIC VNR; TESLA;
FREIGHTLINER E-CASCADIA**

Liquefied natural gas (**LNG**)

Compressed natural gas (**CNG**)

**Major fleets using CNG:**

**EBi:** 200 Trucks
**UPS**
**Waste Management**
**CTS**
**FEDEX**
**CAT:** 100 Trucks
**EXPRESS MONDOR:** 23 Trucks with sleepers and aiming for 50

**Compressed natural gas for vehicles:** Overview of natural gas

Convenient and safe, this format is mostly used for trucks.
Composed of 95% methane.
Extracted from the soil or generated by bio-metanization (decomposition, burial, etc.).
Odorless, we add mercaptan (rotten eggs) to facilitate its detection.
Less greenhouse gas emissions  than diesel or gasoline.
Lighter than air, it disperses in the atmosphere when released.

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Costs less than $0.60/liter.
The price at the pump is stable.

**Statistiques:**

**Natural gas vehicle fleets:**
Global: 27 million
United States: 150 000
Canada: 5 000
Quebec: 515*

* Quebec has a total of 800 natural gas vehicles (small, medium and large CNG +LNG)
Of this number, **515 are Class 6-7-8 trucks powered by CNG.**
(Data = ÉNERGIR 2020)

**Environnement:**
•Very few polluting emissions.
•<u>No</u> risk of spillage or soil contamination.

**Security:**
CNG's have a very high auto-ignition temperature compared to traditional fuels making it much safer in an accident.
Diesel = **210ºC;** Gasoline = **280ºC;** CNG = **538ºC**

Tanks are much more resistant than gasoline/diesel. Their expected lifespan is 15 to 20 years.

The tanks have a pressure relief device (PRD) that opens when exposed to <u>intense heat</u>, preventing overpressure and explosion

**Special features:**

Pressure variation vs autonomy: Example;

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At **-15° C**                          At **+20° C**

Different gauge readings despite having identical ranges of 800 km


**Noise pollution:**
The combustion being closer to a gasoline engine than to a diesel engine, makes the CNG engine very quiet. We are talking about a reduction of at least 10 decibels.


**Refueling: Private or public stations**
• Much cleaner fueling.
• No risk of spillage on the ground.
• A single filling port, regardless of the number of tanks.

**Two modes to choose from:**
Rapid
Allows filling during your work shift (10-12 min).
Gradual **(2-8h)**
Allows gradual filling over several hours between two work shifts (most often at night)

**Engine manufacturer:**
In North America, **Cummins** is the sole manufacturer of CNG engines.

**The future:**
Electric hybrid trucks with CNG generators.
Very promising future given its torque (2500 lb/ft)

**(2.2.8)**