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**FleetSmart Program**

# Fuel Efficiency Benchmarking in Canada's Trucking Industry

## Results of an Industry Survey

March 2000


Natural Resources Canada
Office of Energy Efficiency

Ressources naturelles Canada
Office de l'efficacité énergétique

Canada

# FleetSmart

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Produced by the
Office of Energy Efficiency
**FleetSmart Program**

FleetSmart works with fleet and industry associations to help reduce fuel costs and vehicle emissions through energy efficiency. FleetSmart also develops energy use data and profiles for fleets and provides a range of services, including energy management information and SmartDriver training for professional drivers. Visit our Web site at http://oee.nrcan.gc.ca/fleetsmart.

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# Introduction

Trucking is a $37-billion industry in Canada. In 1998, almost half of the industry's 650 000 registered trucks were heavy-duty vehicles weighing more than 15 000 kg (33 000 lbs.) in gross vehicle weight (GVW). They were used primarily to transport freight between urban centres. Heavy-duty trucks have long played a critical role in moving freight across Canada and to export markets in the U.S. and Mexico – and their use is growing.

Forty-one percent of the energy used to transport freight in Canada in 1998 was used by heavy-duty trucks, and the commercial road transportation sector produces 19 percent of the total emissions in Canada. Carbon dioxide ($CO_2$) is the principal greenhouse gas (GHG) that contributes to the global problem of climate change. Canadian truck fleets and owner-operators have taken steps to improve their fuel efficiency so that they can reduce operating costs, stay competitive and cut emissions.

There are numerous success stories of fleets that have reduced their overall fuel consumption. However, there is a lack of benchmark data that would allow carriers to compare their fuel economy to the best practices of other fleets that have trucks of similar types and duty cycles.

Many experts believe that fuel efficiency benchmarking can help the inter-city trucking industry further reduce its energy consumption and curb GHG emissions. Toward this end, Natural Resources Canada (NRCan) – through the Office of Energy Efficiency's (OEE) FleetSmart Program – commissioned a national survey on fuel economy. With the support of all the major trucking associations in Canada, L-P Tardif & Associates Inc. conducted the survey in March 2000.

## The Survey Sample

The FleetSmart benchmarking survey is limited to private and for-hire trucking fleets based in Canada. It focuses on inter-city transport fleets operating Class 7 and 8 power units. Of the approximately 100 trucking fleets invited to participate, 42 responded to the survey: one from Atlantic Canada, 18 from Quebec, 12 from Ontario, eight from the Prairie provinces and three from British Columbia (see Appendix 2 for the complete list of respondents).

These fleets operated a total of 9441 power units (6822 tractors and 2619 straight trucks). Ten were private trucking fleets, while 32 were for-hire operations. (Many private trucking fleets operate Class 5 and 6 power units, known as straight trucks, and may not have perceived the survey as being relevant to them.)

Table 1 provides a breakdown of respondents by fleet size and average distance travelled.

Table 1
**Survey Respondents by Fleet Size and Distance Travelled**

| **Fleet Size** (number of power units) | **Number of Fleets** | **Average Distance by Power Unit** (in kilometres and miles) | | | |
|---|---|---|---|---|---|
| | | **For-Hire** | | **Private** | |
| | | Kilometres | Miles | Kilometres | Miles |
| 1–10 | 9 | 222 042 | 137 971 | 124 537 | 77 384 |
| 11–25 | 6 | 160 023 | 99 434 | 139 983 | 86 981 |
| 26–50 | 5 | 165 727 | 102 978 | 136 765 | 84 982 |
| 51–100 | 7 | 151 404 | 94 078 | – | – |
| More than 100 | 15 | 234 914 | 145 969 | 157 682 | 97 979 |

# Fuel Efficiency Highlights

1. Electronic engines, improved vehicle specifications, advanced vehicle aerodynamics and on-board monitoring devices contribute to better fuel economy in heavy-duty trucks.

2. The average fuel efficiency of the fleets was 39.5 L/100 km (7.15 m.p.g.) in 1999. This excludes fleets operating B-trains, which had a substantially lower average fuel efficiency. Forty percent of the fleets showed an improvement in fuel efficiency over 1998.

3. Fuel efficiency can vary by as much as 3 to 5 L/100 km (0.5 to 1.0 m.p.g.) between summer and winter, without taking into account travel distance or other factors.

4. Close to 70 percent of the fleets delivered some form of driver training in fuel efficiency; about 24 percent had driver incentive programs.

5. Almost 95 percent of the fleets checked tire pressure regularly, and most had a policy on maximum vehicle speed.

6. More and more fleets are programming engines to shut off automatically after a set period of idling. Thirty percent of the fleets used add-ons, such as cab heaters, to minimize idling.

7. Most vehicles (60 percent) had engines that range from 351 to 400 hp, although there seems to be a growing move to larger engines (more than 425 hp). Only nine percent of the vehicles had engines with less than 350 hp.

# Detailed Results

## Number of Power Units and Average Age of Fleet

The 42 fleets that responded to the survey operated a total of 9441 power units; 72 percent (6822) of the units were tractors and 28 percent (2619) were straight trucks.

Tractors ranged in age from one to eight years, with an average age across all fleets of 3.7 years. Straight trucks tended to be older, with an average age of 5.1 years.

Although the survey did not find a pattern in the age of fleets, some small fleets tended to keep their power units longer.

## Drivers

The vast majority of trucking fleets – some 80 percent – hired their own drivers. While half of the fleets used owner-operators as drivers, only seven fleets had more than 25 percent of their drivers as owner-operators.

Driver agencies appear to be emerging as an important source of drivers for some trucking fleets. Four private fleets engaged all of their drivers from agencies.

## Fuel Efficiency

The average fuel efficiency of the fleets was 39.5 L/100 km (7.15 m.p.g.) in 1999. This does not include fleets operating B-trains, which had a substantially lower average fuel efficiency of 57.6 L/100 km (4.9 m.p.g.). The fleets' fuel efficiency varied as much as 3 to 5 L/100 km (0.5 to 1.0 m.p.g.) between summer and winter, without considering travel distances or other factors.

The best year-round fuel efficiency of any fleet was 33.2 L/100 km (8.5 m.p.g.). Four fleets had average fuel efficiencies of 35 L/100 km (8 m.p.g.) or better, and 15 fleets ranged from 35 to 40 L/100 km (7 to 8 m.p.g.). The most fuel-efficient fleets operated mainly in the flat terrain of southern Ontario and tended to move freight that is measured by volume (rather than weight).

Forty percent of the fleets made year-to-year improvements in fuel efficiency from 1997 to 1999. This indicates that the overall fuel efficiency of the Canadian fleet continues to improve, but not as rapidly as in the past.

Fewer than 50 percent of the fleets included data from owner-operators when calculating their fuel efficiency. One fleet used estimated data; the rest based their fuel efficiency on actual company data.

## Distance Travelled

The average distance travelled per power unit per year was 146 000 km (91 000 mi.) in 1999. For-hire fleets that used two- and three-axle trailers travelled the most distance per unit. Private fleets and those using mostly B-trains tended to travel less. Nine fleets had average travel distances of more than 160 000 km (100 000 mi.) per year.

Between 1998 and 1999, 55 percent of the fleets that responded increased travel distance per unit, 20 percent declined and 17 percent reported no change. Some fleets did not have enough data to respond.

## Equipment

The majority of vehicles (60 percent) in the 42 fleets had engines ranging in size from 351 to 400 hp. Only nine percent of the vehicles had engines with less than 350 hp. However, the number of vehicles with engines of 425 hp or more appears to be increasing.

The most popular transmissions were 10- and 18-gear configurations; each accounted for about 33 percent of the market. Thirteen-gear transmissions were also popular, capturing about 22 percent of the market.

A few fleets, all located in eastern Canada, used automatic transmissions. Although these transmissions are relatively new to the industry, their use is expected to grow.

Most fleets operated a range of trailer types. However, six fleets used only two-axle semitrailers, three used only three-axle semitrailers and two used B-trains exclusively.

## Measures to Improve Fuel Economy

Fleets identified specific measures they had taken to improve fuel economy and to assess their impact. Their responses are summarized here:

- **Taking advantage of improved engine technology** – All fleets identified this fuel-saving measure. Some fleets improved fuel efficiency by as much as 10 L/100 km (1.5 m.p.g.) when they switched from mechanical engines to the first generation of electronic engines. When they later switched to the new generation of electronic engines, they improved fuel efficiency by a further 4 L/100 km (0.5 m.p.g.).
- **Improved vehicle specification and aerodynamics** – Many respondents said that advanced vehicle aerodynamics improved fuel efficiency, in some cases by an estimated 10 percent of the fleet average.
- **Installing a fuel performance display on the dashboard and/or equipping all tractors with on-board monitoring devices** – Half of the fleets had installed these devices. However, they had different opinions on their impact because some drivers did not take advantage of this technology. When drivers actually used the information from the devices, fuel efficiency generally improved.
- **Driver training in fuel efficiency** – Close to 70 percent of the fleets delivered some form of fuel efficiency training for drivers. In some fleets, training and information programs are ongoing.
- **Checking tire pressure** – Close to 95 percent of the fleets checked tire pressure regularly. However, the definition of "regularly" varied significantly. Some fleets monitored tire pressure every day or after every trip, while others did so less frequently.
- **Restricting vehicle speed** – Policies on maximum vehicle speed varied significantly from fleet to fleet. About five percent of the fleets specified a maximum highway speed of 90 km/h. Other fleets simply advised drivers to abide by the posted speed limit. In addition, some fleets programmed engines not to exceed a certain speed, instead of articulating a policy.
- **Reducing vehicle idling** – About half of the fleets programmed engines to automatically shut off after two to 15 minutes of idling. More and more fleets appear to be taking advantage of this option, which is now available for all electronic engines. At the same time, many fleets left idling to the discretion of drivers, who may idle the engine to warm or cool the tractor while they sleep. Fleets that allow this practice can experience higher idling rates.
- **Driver incentive programs** – Ten of the 42 fleets offered some form of driver incentive program. However, only four fleets had a full incentive program with rewards; the other six posted the best fuel economy results of drivers over a set period of time. Several fleets were considering incentive programs.
- **Regular vehicle maintenance** – Although all fleets had regular maintenance programs, their effect on fuel efficiency is difficult to quantify. Some fleets estimated that regular maintenance may have improved fuel efficiency by up to 1.5 percent.
- **Downloading information from engines** – More than 75 percent of the fleets regularly downloaded information from vehicle engines. The interval between downloads varied from fleet to fleet; these were often done when a vehicle was scheduled for preventive maintenance. Large fleets appear to download engine data more frequently than smaller fleets.
- **Use of add-ons** – Thirteen fleets used add-ons such as cab heaters. These fleets also tended to have an idling policy.

## Performance Measurements for Paired Cities

Fleets were asked to select a pair of cities and identify their best performance – from a fuel economy perspective – for runs between the cities. Since fuel performance typically varies significantly from one season to another, the fleets were asked to provide this information for three periods during the year. Specifications for the vehicles serving the paired cities and details about other technical factors affecting fuel performance (such as average speed and idling time) were also requested.

Finally, to measure the productivity of runs between the paired cities, fleets were asked to provide either an average payload for the run or the gross vehicle weight (GVW) of the transport unit that was used. Payload is commonly used as a measurement by fleets involved in less-than-truckload operations. GVW, meanwhile, is used more often by fleets involved in truckload movements and in transporting bulk commodities (such as petroleum).

Twenty-three fleets answered these questions, and their responses are summarized in the following tables.

## Example 1. **Toronto–Indiana**

| **Time of Year** | **Fuel Efficiency** (L/100 km) | **Engine Size** (hp) | **Total Gears** | **Torque** (ft.-lbs.) | **Add-Ons** (heaters) | **Idling Time** (%) | **Average Speed** (km/h) | **Semi-trailer** (number of axles) | **Average Load** (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 39.7 (7.1 m.p.g.) | 430 | 13 | 1650 | yes | 1 | 90 (55 mph) | 9-axle B-train | 59 (130 000 lbs.) |
| July–Sept. | 39.7 (7.1 m.p.g.) | 430 | 13 | 1650 | yes | 1 | 90 (55 mph) | 9-axle B-train | 59 (130 000 lbs.) |
| Oct.–March | 47 (6.0 m.p.g.) | 430 | 13 | 1650 | yes | 1 | 90 (55 mph) | 9-axle B-train | 59 (130 000 lbs.) |

## Example 2. **Within Alberta**

| **Time of Year** | **Fuel Efficiency** (L/100 km) | **Engine Size** (hp) | **Total Gears** | **Torque** (ft.-lbs.) | **Add-Ons** (heaters) | **Idling Time** (%) | **Average Speed** (km/h) | **Semi-trailer** (number of axles) | **Average Payload** (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 60.7 (4.7 m.p.g.) | 470 | 18 | 1650 | no | 12–14 | 70 (44 mph) | 8-axle B-train | 63.6 (140 000 lbs.) |
| July–Sept. | 59.4 (4.8 m.p.g.) | 470 | 18 | 1650 | no | 12–14 | 70 (44 mph) | 8-axle B-train | 63.6 (140 000 lbs.) |
| Oct.–March | 64.6 (4.4 m.p.g.) | 470 | 18 | 1650 | no | 12–14 | 70 (44 mph) | 8-axle B-train | 63.6 (140 000 lbs.) |

## Example 3. **Brampton–Kingston**

| **Time of Year** | **Fuel Efficiency** (L/100 km) | **Engine Size** (hp) | **Total Gears** | **Torque** (ft.-lbs.) | **Add-Ons** (heaters) | **Idling Time** (%) | **Average Speed** (km/h) | **Semi-trailer** (number of axles) | **Average Payload** (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 39.2 (7.2 m.p.g.) | 370 | 10 | 1450 | no | 0 | 90 (55 mph) | 8-axle B-train | 11.4 (25 000 lbs.) |
| July–Sept. | 38.1 (7.4 m.p.g.) | 370 | 10 | 1450 | no | 0 | 90 (55 mph) | 8-axle B-train | 11.4 (25 000 lbs.) |
| Oct.–March | 42.1 (6.7 m.p.g.) | 370 | 10 | 1450 | no | 0 | 90 (55 mph) | 8-axle B-train | 11.4 (25 000 lbs.) |

**Note:** Results are based on averages of runs between points of origin and points of destination.

## Example 4. **London–Windsor and Sarnia–Windsor**

| **Time of Year** | **Fuel Efficiency** (L/100 km) | **Engine Size** (hp) | **Total Gears** | **Torque** (ft.-lbs.) | **Add-Ons** (heaters) | **Idling Time** (%) | **Average Speed** (km/h) | **Semi-trailer** (number of axles) | **Average Payload** (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| July–Sept. | 51.3 (5.5 m.p.g.) | 430 | 15 | 1450 | no | 30 | 95 (60 mph) | 8-axle B-train | 19.1 (42 100 lbs.) |

## Example 5. **Thetford Mines–Montréal**

| **Time of Year** | **Fuel Efficiency** (L/100 km) | **Engine Size** (hp) | **Total Gears** | **Torque** (ft.-lbs.) | **Add-Ons** (heaters) | **Idling Time** (%) | **Average Speed** (km/h) | **Semi-trailer** (number of axles) | **Average Payload** (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 42.3 (6.7 m.p.g.) | 400 | 10 | 1600 | – | 5 | 95 (60 mph) | 8-axle B-train | 18.2 (40 000 lbs.) |
| July–Sept. | 42.7 (6.6 m.p.g.) | 400 | 10 | 1600 | – | 7 | 95 (60 mph) | 8-axle B-train | 18.2 (40 000 lbs.) |
| Oct.–March | 47.1 (6.0 m.p.g.) | 400 | 10 | 1600 | – | 10 | 95 (60 mph) | 8-axle B-train | 18.2 (40 000 lbs.) |

## Example 6. **Winnipeg–Vancouver**

| **Time of Year** | **Fuel Efficiency** (L/100 km) | **Engine Size** (hp) | **Total Gears** | **Torque** (ft.-lbs.) | **Add-Ons** (heaters) | **Idling Time** (%) | **Average Speed** (km/h) | **Semi-trailer** (number of axles) | **Average Load** (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 46.3 (6.1 m.p.g.) | 425 | 10 | 1550 | yes | 13 | 100 (62 mph) | 7-axle B-train | 36 (80 000 lbs.) |
| July–Sept. | 43.0 (6.6 m.p.g.) | 425 | 10 | 1550 | yes | 13 | 100 (62 mph) | 7-axle B-train | 36 (80 000 lbs.) |
| Oct.–March | 48.4 (5.8 m.p.g.) | 425 | 10 | 1550 | yes | 13 | 100 (62 mph) | 7-axle B-train | 36 (80 000 lbs.) |

## Example 7. **Québec–Baie-Comeau**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Load (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 47.9 (5.9 m.p.g.) | 565 | 18 | 1350 | yes | – | 78 (48 mph) | 4 axles | 55 (121 250 lbs.) |
| July–Sept. | 47.9 (5.9 m.p.g.) | 565 | 18 | 1350 | yes | – | 78 (48 mph) | 4 axles | 55 (121 250 lbs.) |
| Oct.–March | 48.4 (5.4 m.p.g.) | 565 | 18 | 1350 | yes | – | 78 (48 mph) | 4 axles | 55 (121 250 lbs.) |

## Example 8. **Montréal to Points in Quebec**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Load (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 45.2 (6.2 m.p.g.) | 430 | 15 | 2100 | yes | – | 90 (55 mph) | 4 axles | 56.6 (124 550 lbs.) |
| July–Sept. | 43.7 (6.5 m.p.g.) | 430 | 15 | 2100 | yes | – | 90 (55 mph) | 4 axles | 56.6 (124 550 lbs.) |
| Oct.–March | 51.6 (5.5 m.p.g.) | 430 | 15 | 2100 | yes | – | 90 (55 mph) | 4 axles | 56.6 (124 550 lbs.) |

## Example 9. **St. Mary's–Buffalo (80-percent loaded ratio)**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Payload (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 44.8 (6.3 m.p.g.) | 430 | 13 | 1550 | no | 5 | 90 (55 mph) | 3 axles | 32.2 (71 000 lbs) |
| July–Sept. | 43.4 (6.5 m.p.g.) | 430 | 13 | 1550 | no | 5 | 90 (55 mph) | 3 axles | 32.2 (71 000 lbs) |
| Oct.–March | 51.3 (5.5 m.p.g.) | 430 | 13 | 1550 | no | 5 | 90 (55 mph) | 3 axles | 32.2 (71 000 lbs) |

## Example 10. **Toronto–Montréal**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Payload (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 37.6 (7.5 m.p.g.) | 400 | 10 | 1450 | no | 2 | 100 (62 mph) | 3 axles | 30 (66 000 lbs.) |
| July–Sept. | 35.3 (8.0 m.p.g.) | 400 | 10 | 1450 | no | 1 | 100 (62 mph) | 3 axles | 30 (66 000 lbs.) |
| Oct.–March | 40.3 (7.0 m.p.g.) | 400 | 10 | 1450 | no | 3 | 100 (62 mph) | 3 axles | 30 (66 000 lbs.) |

## Example 11. **Montréal–Toronto**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Load (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 45.9 (6.1 m.p.g.) | 430 | 13 | 1650 | no | 17 | 100 (62 mph) | 3 axles | 36 (80 000 lbs.) |
| July–Sept. | 43.8 (6.4 m.p.g.) | 430 | 13 | 1650 | no | 19 | 100 (62 mph) | 3 axles | 36 (80 000 lbs.) |
| Oct.–March | 46.4 (6.1 m.p.g.) | 430 | 13 | 1650 | no | 17 | 100 (62 mph) | 3 axles | 36 (80 000 lbs.) |

## Example 12. **Québec–Chicoutimi**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Payload (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 45.5 (6.2 m.p.g.) | 370 | 10 | 1200 | yes | 10 | 95 (60 mph) | 3 axles | 24 (48 500 lbs.) |
| July–Sept. | 47.8 (5.9 m.p.g.) | 370 | 10 | 1200 | yes | 5 | 95 (60 mph) | 3 axles | 24 (48 500 lbs.) |
| Oct.–March | 52.7 (5.4 m.p.g.) | 370 | 10 | 1200 | yes | 3 | 95 (60 mph) | 3 axles | 24 (48 500 lbs.) |

## Example 13. **Toronto–Windsor**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Payload (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 33.2 (8.5 m.p.g.) | 350 | 10 | 1350 | no | 16 | 75 (47 mph) | 2 axles | 11.4 (25 000 lbs.) |
| July–Sept. | 32.3 (8.75 m.p.g.) | 350 | 10 | 1350 | no | 16 | 75 (47 mph) | 2 axles | 11.4 (25 000 lbs.) |
| Oct.–March | 34.6 (8.37 m.p.g.) | 350 | 10 | 1350 | no | 18 | 72 (45 mph) | 2 axles | 11.4 (25 000 lbs.) |

## Example 14. **Québec–Atlanta**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Load (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 38.4 (7.4 m.p.g.) | 460 | 13 | 1650 | yes | 4.4 | 82 (50 mph) | 2 axles | 36 (80 000 lbs.) |
| July–Sept. | 37.1 (7.6 m.p.g.) | 460 | 13 | 1650 | yes | 6.1 | 82 (50 mph) | 2 axles | 36 (80 000 lbs.) |
| Oct.–March | 39.1 (7.2 m.p.g.) | 460 | 13 | 1650 | yes | 9.8 | 82 (50 mph) | 2 axles | 36 (80 000 lbs.) |

## Example 15. **New Brunswick–U.S. Eastern Seaboard–Southern Ontario**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Load (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| July–Sept. | 38.7 (7.3 m.p.g.) | 460 | 18 | 1550 | no | 10 | 68 (42 mph) | 2 axles | 38.6 (85 000 lbs.) |

## Example 16. **Montréal–U.S. Midwest**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Payload (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 35.3 (8.0 m.p.g.) | 380 | 10 | – | yes | 5 | 90 (55 mph) | 2 axles | 16 (35 000 lbs.) |
| July–Sept. | 35.3 (8.0 m.p.g.) | 380 | 10 | – | yes | 5 | 90 (55 mph) | 2 axles | 16 (35 000 lbs.) |
| Oct.–March | 40.5 (7.0 m.p.g.) | 380 | 10 | – | yes | 5 | 90 (55 mph) | 2 axles | 16 (35 000 lbs.) |

## Example 17. **Ste-Marie–Montréal**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Payload (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 34.8 (8.1 m.p.g.) | 370 | 13 | – | no | 6 | 70 (44 mph) | 2 axles | 18.2 (40 000 lbs.) |
| July–Sept. | 33.7 (8.3 m.p.g.) | 370 | 13 | – | no | 6 | 70 (44 mph) | 2 axles | 18.2 (40 000 lbs.) |
| Oct.–March | 37.6 (7.5 m.p.g.) | 370 | 13 | – | no | 6 | 70 (44 mph) | 2 axles | 18.2 (40 000 lbs.) |

## Example 18. **Rawdon–Montréal**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Load (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 35.3 (8.0 m.p.g.) | 325 | 13 | – | no | – | 100 (62 mph) | 2 axles | 13.6 (30 000 lbs.) |
| July–Sept. | 31.4 (9.0 m.p.g.) | 325 | 13 | – | no | – | 100 (62 mph) | 2 axles | 13.6 (30 000 lbs.) |
| Oct.–March | 41.5 (6.8 m.p.g.) | 325 | 13 | – | no | – | 100 (62 mph) | 2 axles | 13.6 (30 000 lbs.) |

## Example 19. **Toronto–Halifax**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Payload (tonnes) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 45.4 (6.2 m.p.g.) | 350 | 10 | – | – | – | 90 (55 mph) | 2 axles | 19.1 (42 000 lbs.) |
| July–Sept. | 45.4 (6.2 m.p.g.) | 350 | 10 | – | – | – | 90 (55 mph) | 2 axles | 19.1 (42 000 lbs.) |
| Oct.–March | 44.6 (6.3 m.p.g.) | 350 | 10 | – | – | – | 90 (55 mph) | 2 axles | 19.1 (42 000 lbs.) |

## Example 20. **Québec–Miami**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Load (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 52.9 (5.3 m.p.g.) | 400 | 13 | – | yes | – | 110 (68 mph) | 2 axles | 36 (80 000 lbs.) |
| July–Sept. | 44.4 (6.35 m.p.g.) | 400 | 13 | – | yes | – | 110 (68 mph) | 2 axles | 36 (80 000 lbs.) |

## Example 21. **Winnipeg–Minneapolis**

| Time of Year | Fuel Efficiency (L/100 km) | Engine Size (hp) | Total Gears | Torque (ft.-lbs.) | Add-Ons (heaters) | Idling Time (%) | Average Speed (km/h) | Semi-trailer (number of axles) | Average Load (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 38.1 (7.4 m.p.g.) | 430 | 13 | – | yes | 20 | 95 (60 mph) | 2 axles | 9.1 (20 000 lbs.) |
| July–Sept. | 35.5 (8.0 m.p.g.) | 430 | 13 | – | yes | 15 | 95 (60 mph) | 2 axles | 9.1 (20 000 lbs.) |
| Oct.–March | 40.7 (7.1 m.p.g.) | 430 | 13 | – | yes | 26 | 95 (60 mph) | 2 axles | 9.1 (20 000 lbs.) |

## Example 22. **Toronto–Texas**

| **Time of Year** | **Fuel Efficiency** (L/100 km) | **Engine Size** (hp) | **Total Gears** | **Torque** (ft.-lbs.) | **Add-Ons** (heaters) | **Idling Time** (%) | **Average Speed** (km/h) | **Semi-trailer** (number of axles) | **Average Load** (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 37.6 (7.5 m.p.g.) | 425 | 18 | 1350 | – | – | 100 (62 mph) | 2 axles | 11.4 (25 000 lbs.) |
| Oct.–March | 39.7 (7.1 m.p.g.) | 425 | 18 | 1350 | – | – | 100 (62 mph) | 2 axles | 11.04 (25 000 lbs.) |

## Example 23. **Oakville–Sarnia**

| **Time of Year** | **Fuel Efficiency** (L/100 km) | **Engine Size** (hp) | **Total Gears** | **Torque** (ft.-lbs.) | **Add-Ons** (heaters) | **Idling Time** (%) | **Average Speed** (km/h) | **Semi-trailer** (number of axles) | **Average Load** (tonnes gross vehicle weight) |
|---|---|---|---|---|---|---|---|---|---|
| April–June | 33.3 (8.5 m.p.g.) | 400 | 13 | 1450 | – | 10 | 100 (62 mph) | 2 axles | 22.0 (48 434 lbs.) |
| July–Sept. | 38.8 (7.3 m.p.g.) | 400 | 13 | 1450 | – | 10 | 100 (62 mph) | 2 axles | 23.2 (50 992 lbs.) |
| Oct.–March | 40.5 (7.0 m.p.g.) | 400 | 13 | 1450 | – | 10 | 100 (62 mph) | 2 axles | 22.3 (49 107 lbs.) |

# Conclusions

The following conclusions can be drawn from the survey:

1. Canada's trucking industry continues to improve its fuel efficiency. Half of the fleets reported an annual fuel efficiency of 40 L/100 km (7 m.p.g.) or better.
2. New fuel-saving technology (e.g., improved engines and aerodynamics) can be quickly introduced to a fleet because the average tractor age is only 3.7 years.
3. Average engine horsepower ratings are increasing, and automatic transmissions are becoming more popular (particularly in eastern Canada).
4. Fleet operators are able to provide valuable data on truck fuel efficiency. However, in order to set "best results" benchmarks, more detailed data gathering and analysis is needed at the fleet level.
5. Large trucking fleets (i.e., those operating more than 100 power units) apparently have more difficulty retrieving fuel efficiency information from their databases than smaller fleets.
6. A set of common performance indicators is needed to allow accurate comparisons of fuel efficiency among different fleets. One example of such an indicator is the ratio of L/100 km per tonne transported.

The Canadian trucking industry has confirmed that fuel efficiency benchmarking is an important and valuable exercise. The March 2000 survey has proven to be a successful and informative initiative.

Building on this first effort, future surveys will try to involve more fleet operators, gather more detailed data and allow a more thorough analysis of the results. The goal is to establish a solid fuel efficiency benchmarking practice. This will support Canada's trucking industry as it competes economically and contributes to the country's climate change goals.

## For More Information


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# Appendix 1. **Survey Form**

The survey questionnaire was developed by L-P Tardif & Associates Inc. in consultation with the FleetSmart Program and the representatives of several trucking fleets. Two fleets validated the survey before it was distributed across Canada.

## *Fuel Efficiency Benchmarking Survey*

The identity of respondents will be kept in the strictest of confidence. The information provided will be used in combination with data from other firms for statistical purposes only.

*Name and phone number of person completing this form (in case of need for clarification):*

Name: _____ Phone number: ( _____ ) _____

1. **Number of power units in fleet:** Tractors: _____ Straight trucks: _____
   **Average age:** Tractors: _____ Straight trucks: _____

2. **Please indicate the percentage of:**
   Owner-Operators: ____% Employee drivers: ____% Agency drivers: ____%

3. **What is your current fleet fuel economy** (in imperial gallons)**:**
   **Line Haul Operations:** Summer: _____ m.p.g. Winter: _____ m.p.g. Overall: _____ m.p.g.
   **P & D** (if applicable)**:** Summer: _____ m.p.g. Winter: _____ m.p.g. Overall: _____ m.p.g.

4. **Is the above fuel economy:** ❑ Estimated ❑ Based on company data

5. **Does your fleet fuel economy include:**
   **Owner-operators:** ❑ Yes ❑ No **Agency drivers:** ❑ Yes ❑ No

6. **Please indicate how your fuel economy has changed recently:**

| **Year** | **Total Distance Travelled** | **Fleet Average Fuel Economy** (m.p.g.) | | |
|---|---|---|---|---|
| | | Summer | Winter | Overall |
| 1997 | | | | |
| 1998 | | | | |
| 1999 | | | | |

7. **What type of equipment do you operate in your fleet?**

| **Engines** (%) | | **Drivetrain** |
|---|---|---|
| Mack | | |
| Cummins | | |
| Detroit | | |
| Cat | | |
| Volvo | | |

| **Horsepower range** (%) | |
|---|---|
| 325-350 | |
| 350-375 | |
| 375-400 | |
| 400-425 | |
| 425 and over | |

| **Semitrailers** (%) | |
|---|---|
| Pop trailers | |
| 2-axle semi | |
| 3-axle semi | |
| 4-axle semi | |
| B-train | |
| LCV | |

| **Transmission** (%) | |
|---|---|
| 8 | |
| 9 | |
| 13 | |
| 15 | |
| 18 | |

8 (a). **We are also trying to establish best performance measurements. Using your best run (or runs), please indicate your fuel economy and indicate the variable noted:**

| **Time of Year** | **Fuel Economy** (m.p.g.) | **Engine Type and Power** | **Trans-mission** | **Torque** | **Add-Ons** (heaters) | **Idling Time** (%) | **Average Speed** | **Semi-Trailer** (No. of axles) | **Average Load** |
|---|---|---|---|---|---|---|---|---|---|
| April – June | | | | | | | | | |
| July – Sept. | | | | | | | | | |
| Oct. – March | | | | | | | | | |

8 (b). **For what city pair would the run be?**

City 1: _____ City 2: _____

9. **Please identify which measures you have used for an improvement in fuel economy and briefly describe the benefits:**

| Measures | Please describe briefly actions taken or policy |
|---|---|
| Improve engine technology | |
| Improve vehicle specifications, aerodynamics | |
| Install fuel performance display on dashboard | |
| Equip all tractors with on-board computers | |
| Driver training in fuel economy? Refresher training? How often? | |
| Tire pressure – How often do you check tire pressure? | |
| Speed policy – Has it changed over the past two years? How? | |
| Reduced idling – Do you have automatic shut-off? | |
| Incentive program – Do you publicize and reward best performance in the fleet? | |
| Vehicle maintenance practices – Do you have a preventive program? | |
| Do you download information from the engine? How often? | |
| Do you use add-ons such as cab heaters? | |

***Thank you for your assistance!*** Please fax to Louis-Paul Tardif at **(613) 225-7055**.

# Appendix 2. **Survey Respondents**

The FleetSmart Program of the Office of Energy Efficiency would like to thank all who participated in this survey.

**Arrow Transportation Systems Inc.** – British Columbia

**Bison Transport** – Manitoba

**Bourassa Transport Inc.** – Quebec

**Canada Colors & Chemicals Ltd.** – Ontario

**Canadian Freightways Ltd. (Line Haul Division)** – Alberta

**Canadian General Tower Ltd.** – Ontario

**Challenger Motor Freight Inc.** – Ontario

**Culinar Inc.** – Quebec

**Custom Transport Ltd.** – Manitoba

**Ganeca Transport Inc.** – Quebec

**Guimond, Rejean** – Quebec

**JD Smith Transport** – Ontario

**Hutton Transport Ltd.** – Ontario

**Kruger Paper** – Quebec

**L Bilodeau & Fils Ltée** – Quebec

**Les Fermes Rivest** – Quebec

**McConnell Transport Ltd.** – New Brunswick

**Mercury Express Ltd.** – British Columbia

**Molson Breweries** – Quebec

**NRT** – Saskatchewan

**Natrel Inc.** – Quebec

**Petro-Canada** – Ontario

**Pheiffer, Fred** – Ontario

**Praxair** – Ontario

**Provigo** – Quebec

**Prudhomme Transport** – Saskatchewan

**Quik X Transportation Inc.** – Ontario

**Recyclage Camco** – Quebec

**Reimer Express Lines Ltd.** – Manitoba

**Robert Transport–Groupe Robert Inc.** – Quebec

**SDB Freight Systems** – Ontario

**Seibel, Bill** – Saskatchewan

**SGT 2000** – Quebec

**Sunoco** – Ontario

**Transport Asbestos** – Quebec

**Transport Bernières Inc.** – Quebec

**Transport Besner Inc.** – Quebec

**Transport Gingras** – Quebec

**Transport Morneau Inc.** – Quebec

**Trimac Transportation System** – Alberta

**Vedder Transport Ltd.** – British Columbia

**Wolverine Transport** – Ontario

# Notes

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*Leading Canadians to Energy Efficiency at Home, at Work and on the Road*

The Office of Energy Efficiency of Natural Resources Canada is a dynamic organization with a mandate to renew, strengthen and expand Canada's commitment to energy efficiency in order to help address the challenges of climate change.