

DRIVE GREEN



A GUIDE FOR FEDERAL FLEET DRIVERS



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Published by authority of the Minister of the Environment

Cat. No. En21-131/1994E
ISBN 0-662-22507-4

Aussi disponible en français

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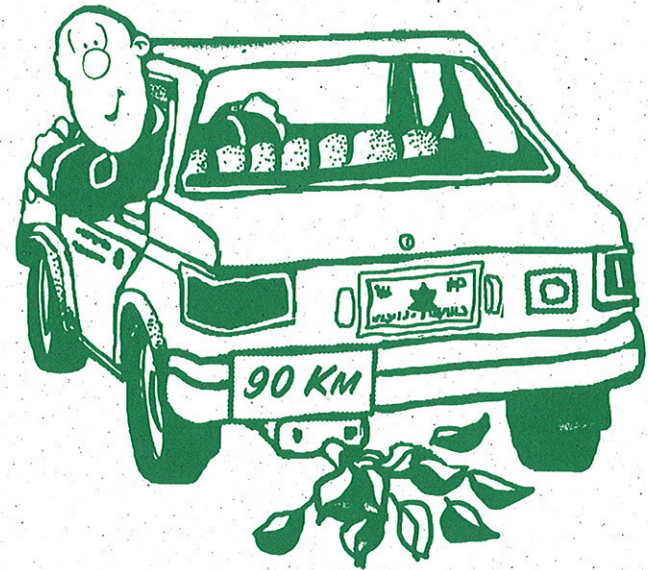
Introduction

The way you drive and maintain your vehicle can greatly affect the environment, from the air you breathe to the water you drink.

Through the adoption of the *Code of Environmental Stewardship*, the federal government is committed to integrating environmental considerations into all aspects of its operations, including the way we buy, operate and manage vehicles for the federal fleet.

Sound driving and maintenance practices contribute to advancing the "greening" of our operations. They support our government's objectives to prevent pollution, reduce fuel consumption and carbon dioxide emissions, minimize waste and save costs.

The purpose of this booklet is to provide information on what you can do to reduce the negative impact of vehicle operation on the environment.



Environmental Issues

This first section explains the various environmental issues related to vehicle operations and their effects on the environment.

Climate Change – the “Greenhouse Effect”

What is it and how is it caused?

Just as the glass of a greenhouse allows energy from the sun to stream in freely and blocks heat from escaping, carbon dioxide and other “greenhouse gases” (such as methane and nitrogen oxides) let sunshine through, but trap the heat given off by the earth. When these gases build up, too much heat is trapped, and we have global warming. Global warming is causing our climate to change.

A major contributor to the greenhouse effect is carbon dioxide, which is produced from the combustion of fossil fuels (coal, oil, gas) in vehicles, industrial boilers and residential furnaces. The average car pumps two to three times its own weight in carbon dioxide into the atmosphere each year. About 30% of all carbon dioxide emissions in Canada are from road vehicles and mostly from personal and commercial light-duty vehicles.

Why is it a problem?

The average global temperature in the 1980s was the highest since temperatures have been recorded, and this is believed to be a result of emissions of greenhouse gases related to human activities. In addition to the warming trend, weather patterns have become less predictable and more extreme, as we have more heat waves, cold snaps, and storms.

Warmer temperatures may sound appealing in the middle of a Canadian winter, but the melting of ice at the North and South Poles could cause major floods and ecological damage, and could change the face of the earth as we know it. Climate change may mean more rain for some regions of Canada, or accentuated dryness for others. Variations in water supply could have an effect on farmers and the crops they grow. Certain species of animals and plants may have trouble adjusting to major changes in our climate, and some may not be able to survive.



Volatile Organic Compounds (VOCs), Nitrogen Oxides (NOx) and Smog

What is the problem?

Vehicles are one of the largest sources of NOx and VOCs being released into the atmosphere. Volatile organic compounds are a chemically diverse group of compounds that have at least one carbon atom and turn into vapours at fairly low temperatures (benzene is a well known example). Nitrogen oxides are produced when fossil fuels (gasoline, diesel, fuel oil, coal) are burned. Most VOCs cause the formation of ground-level ozone or smog when they react with nitrogen oxides in sunlight.

VOCs emitted from vehicles may be in the form of vapours (such as from spilled gasoline or from a vehicle's tank when refuelling) or exhaust (tailpipe) emissions.

What are the harmful effects?

Long-term exposure to ground-level ozone (or smog) can irritate the eyes and be harmful to the lungs. Shortness of breath, pain when taking deep breaths, wheezing, fatigue, headaches and nausea can all result from exposure to smog. Ozone harms the air sacs in the lungs where oxygen and carbon dioxide are exchanged. This soft, spongy tissue gradually hardens and reduces the capacity of the lungs.

Ozone can also be harmful to vegetation. It reduces crop growth, which results in lower yields. How does it do this? Ozone damages leaf tissue, leaving visible signs including yellow spots and paper-thin areas. Eventually, the damaged leaves may fall. Varieties of plants that are particularly sensitive to ozone may one day disappear altogether.

Acid Rain

What is it and how is it caused?

Acid rain is caused primarily by emissions of sulphur dioxide and nitrogen oxides (NOx). When these chemicals mix with water, they become acidic compounds.

The amount of nitrogen oxides in the atmosphere is increasing, mainly due to the burning of oil, gas and coal. Approximately half the nitrogen oxide emissions in Canada are caused by motor vehicle combustion of gasoline.

What are the harmful effects?

Acidic precipitation kills plants and animals in bodies of water. It eats away the surface of buildings and structures, and damages soils and forests. It can also cause respiratory problems for humans.

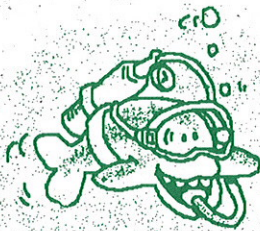
As a lake becomes more and more acidic, many of its small life forms die. This removes the food source for fish which then die as well. As soil becomes more acidic,

vegetation that draws water from the soil can be damaged or die. Acid rain can also affect our health. Tiny drops of highly concentrated acid can enter the lungs. Nitrogen oxides are known to narrow air passages and irritate the lungs, contributing to pneumonia and bronchitis and weakening the body's immune system.

The Ozone Layer

An environmental issue that is not related to the combustion of fuel is the thinning of the ozone layer.

The ozone layer is made up of ozone gas and is about 20 kilometres thick. It is 15 to 35 kilometres above the Earth's surface in the upper atmosphere. Like a pair of sunglasses, the ozone layer acts like a filter, blocking out most of the sun's harmful ultraviolet (UV) rays. The ozone layer is "good" ozone because it protects us from the UV rays. Unfortunately, the "bad" ozone at ground level (smog) does not move up to help the ozone layer.



What causes the thinning of the ozone layer?

The thinning of the ozone layer is caused by a number of chemicals released mainly through human activities – CFCs in particular, which are used in vehicle air conditioners. Escaping chemicals, which are lighter than air, travel upward and are broken down by ultra-violet light into chlorine atoms that eat away at the ozone.

What are the harmful effects?

Due to the depletion of the ozone layer, more people might be prone to get sunburns, skin cancer and cataracts. Plants and animals could also be harmed.

UV rays can cause reductions in crop yields, and a decrease in the growth of the small life forms in our lakes and rivers. Like people, more animals might suffer from cataracts.

Waste and Toxics

The operation and maintenance of vehicles generates both hazardous and non-hazardous wastes. If not properly managed and disposed of, they can cause environmental problems such as soil and ground-water contamination and air pollution, which may in turn be damaging to our health.

What You Can Do To Decrease Energy Consumption, Harmful Emissions and Wastes

The following sections describe what you can do to minimize the environmental impact of vehicle operation.

Fuel Conservation

The most important action you can take to reduce emissions that cause global warming, smog and acid rain is to use fuel as sparingly as possible.

catalytic converter to be working at high efficiency. Use of a block heater and driving slowly after idling for 15 to 30 seconds can help the engine to warm up faster and reduce the emissions produced on those wintry days.

Avoid unnecessary idling

Turn the ignition off if you are going to wait for more than 30 seconds and you are not in traffic.

In winter, most cars require only 15 to 30 seconds of idling before being driven.¹ The emissions from a cold engine are much higher than from an engine that is warmed up enough for the

Plan your route

Don't make any unnecessary trips, and plan your route to include all the places you have to go to rather than making separate trips. This will not only shorten the total distance, but it will also keep your catalytic converter hot for the entire trip. Short trips (less than 10 km) can increase fuel consumption by 20% in summer and by 50% in winter.²



Also, avoid rush-hour traffic and streets that have heavy traffic. A vehicle that is crawling along releases about three times more smog-producing VOCs than one cruising at the most fuel-efficient speed. It has been estimated that a 16 kilometre trip taken in heavy traffic over

30 minutes generates seven grams of volatile organic compounds (VOCs). The same trip in light traffic over 11 minutes produces only two grams of VOCs (a 250% decrease).³

And avoid rough roads where possible: smooth road surfaces can reduce fuel consumption by 10 to 30%.⁴

Use a block heater

As mentioned, the emissions from a cold engine are much higher. Pre-heating the engine with a block heater allows easier starting and more rapid warm-up, and greatly reduces engine wear.

A block heater need not be plugged in for more than one or two hours to provide effective starting. Install a timer and set it to warm your vehicle's engine for one or two hours before driving, instead of plugging it in to operate all night.

Maintain correct tire pressure

Check the tire pressure at least once a month and maintain the maximum tire pressure specified by the vehicle manufacturer. This will decrease fuel consumption and emissions.



Under-inflated tires can increase fuel consumption by 4 to 8%.⁵

Removal of mud and snow tires when they are no longer required will also improve fuel economy.

Maintain moderate speeds and accelerate smoothly

Avoid speeding and abrupt starts and stops. Accelerate smoothly.

The optimum fuel economy for most vehicles is achieved at a steady speed of between 80 and 100 km per hour. Tests show that most cars use about 10% less fuel when driven at 90 instead of 100 km/h.⁶

Avoiding speed changes saves fuel. Accelerate and decelerate gradually. (This will also reduce engine wear.) Anticipating traffic movement will help you to avoid frequent brake applications. Stepping on the accelerator too heavily can use up to four times as much fuel as moderate acceleration.⁷

Refer to the owner's manual to determine optimum gear shift points for manual transmissions.

For example, the owner's manual for a 1992 Ford Taurus recommends the following upshifts for best fuel economy when accelerating:

First to Second	27 km/h
Second to Third	44 km/h
Third to Fourth	56 km/h
Fourth to Fifth	70 km/h

When going up hills, let the vehicle's speed drop off gradually or shift to a lower gear when necessary. When driving down hill, ease up on the accelerator and let gravity move the vehicle.

Remove excess weight from vehicle

Keep the vehicle free of unnecessary objects which would add weight and thereby cause greater fuel consumption. If you carry bags of salt in the trunk during winter, remove them when they are not needed. A roof rack can increase aerodynamic drag and

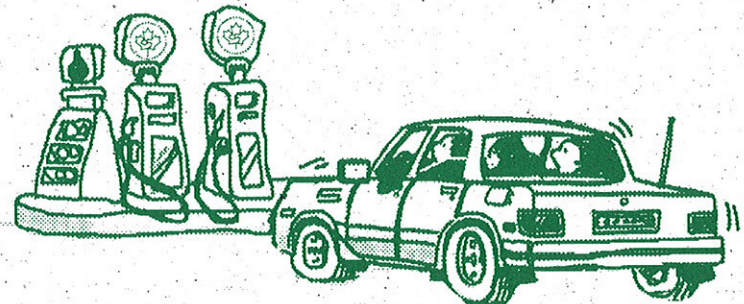
result in higher fuel consumption. A roof rack that is not permanently fixed to the vehicle should be removed when it is not being used.

Fuel Alternatives

Reducing fuel consumption reduces harmful emissions. Using alternative fuels can also have a significant impact in reducing emissions. Alternative fuels are already commercially available in almost all Canadian urban centers. Your acceptance and use of these fuels play a critical role in successfully switching the federal fleet to more environmentally responsible fuels.

Ethanol

Most conventional automobiles and light trucks can use gasoline blended with up to 10% ethanol, without any modification to their fuel systems or engines, and still be covered by the manufacturer's warranty. Vehicles able to run on significantly higher ethanol blends or on pure ethanol are planned for production in the future.



The Environmental Choice[™] Program has branded some ethanol blends with its EcoLogo[™]. To receive Environmental Choice certification, the ethanol portion must have been made from renewable resources such as agricultural or wood products. To maximize the environmental benefits of using this gasoline, only use ethanol-blended gasoline carrying the EcoLogo.

Methanol

Methanol is another liquid alternative fuel. Today, it is sold as a blend of 85% methanol and 15% gasoline, commonly called M85. Because methanol is corrosive, it is expensive to convert existing vehicles to use this fuel. Some manufacturers produce flexible fuel vehicles that are M85 compatible. These flexible fuel vehicles can use any combination of M85 and gasoline; they can also use straight gasoline.

Natural Gas

Natural Gas is generally considered to be the cleanest of all the commercially available fuels and produces low tailpipe emissions.

Most of the vehicles produced in North America can be converted to operate on natural gas. The gas is stored in high-pressure cylinders that are located under the vehicle, or in the trunk or rear compartment. Because the fuel has a low energy content, you need to refuel the vehicle more frequently. For convenience, most conversions leave the original

gasoline system in place in case you need to refuel in a location where natural gas is unavailable.

Propane

Propane is currently the most widely available of the alternative fuels. Most vehicles produced in North America can be converted to propane operation. As with natural gas, propane is stored under pressure in cylinders that are located under the vehicle, or in the trunk or rear compartment. It is also possible to leave the original gasoline system in place as a backup. However, to maximize environmental benefits, only propane should be used.

Preventive Maintenance

Preventive maintenance is an important element in any program to reduce fuel consumption and emissions. Preventive maintenance helps to ensure optimum performance of the vehicle engine and emission control equipment.

Maintenance schedule

Ensure preventive maintenance is carried out according to the schedule in the owner's manual, including regular oil changes. Oil is the vehicle engine's "life blood". It reduces wear caused by friction between the moving parts of the engine and removes acids, sludge and other harmful substances. Oil helps to cool the engine, provides a seal between the cylinder walls and the pistons, and prevents the engine from

rusting. Eventually, oil becomes contaminated and its performance additives deteriorate, so it is important that the oil be changed regularly. Neglecting to replace worn-out oil can result in severe damage to the engine. The oil filter should be changed with every oil change.

Keep records of the preventive maintenance carried out to ensure that the manufacturer's recommendations are followed.

In addition to having the vehicle serviced according to the maintenance schedule, do a quick walk-around inspection to check for fluid leaks and low tire pressure every time you use the vehicle.

Leaking fluids are not only a sure sign that the vehicle needs repair, but the fluids are also harmful to the environment. Routinely inspect the spot where the vehicle is parked for the following signs of fluid leaks, and check for fumes:

Black or dark brown drippings	➔	motor oil or grease
Yellow or green drippings	➔	coolant or antifreeze
Pink or red drippings	➔	transmission fluid
Clear drippings	➔	brake fluid, power steering fluid or gasoline

Air filter

A dirty air filter can cause an engine to consume over 2% more fuel. Rural vehicles travelling on dusty roads will need air filter changes more often.

Exhaust system inspections

The exhaust system should be inspected regularly – a task not necessarily included in regular maintenance. If you suspect a problem with the exhaust system, have it repaired as soon as possible.



If the catalytic converter is malfunctioning, emissions will be much greater than normal. Vehicle emissions should also be checked on a regular basis.

Tune-ups

Most late-model vehicles have electronic engine control systems and are largely self-tuning. Frequent tune-ups on these vehicles are not likely to result in large fuel savings. However, regular tune-ups on older model vehicles can reduce fuel consumption considerably.

Fuel consumption records

Keep records of the vehicle's fuel consumption and review them regularly to be aware of sudden changes in fuel efficiency. If there is a sudden change, take corrective action. The vehicle may have a leak or be in need of a tune-up.

Preventing Release of Ozone-depleting CFCs

Vehicle air conditioning systems in models earlier than 1994 contain, and leak, CFCs. The air conditioners of most of the 1994 vehicle models, and all 1995 models, use refrigerants that are less harmful to the ozone layer than CFCs.

If a vehicle air conditioner contains CFCs, ensure that it is properly maintained. Have the air conditioner serviced by a facility

that is certified to capture, clean and recycle the used CFCs rather than simply venting them into the air and refilling the unit. (British Columbia, Saskatchewan, Manitoba, Ontario, New Brunswick and Nova Scotia have all passed regulations that either require service personnel to recapture CFCs from vehicle air conditioners, or to complete an environmental training program. Other provinces are expected to follow suit.)

Reducing Vehicle-Related Waste and Toxic Substances

Many products used in operating and maintaining vehicles are a direct health hazard either through their vapours, or by seeping into groundwater or entering public waters through the sewer system.

Gasoline contains a number of toxic substances, including benzene which is known to cause cancer. Ensure that you do not spill gasoline when refuelling, and if you suspect a leak in the vehicle's gasoline tank, have it repaired immediately.

The following automotive products are hazardous or toxic and should not be disposed of in the regular garbage system. Some of these products are recyclable and, by ensuring that they are sent for

recycling rather than to landfill or down the sewers, you are taking a positive step for the environment.

We will consider the following wastes: oil, antifreeze, batteries, tires, solvents and cleaning products.

Oil

When changing the oil, do so carefully so as not to spill any on the ground. Take the used oil and oil filter to your service station or other recognized depot for recycling – don't pour it down the sewer or throw it out with regular garbage. Not only is used motor oil itself a pollutant, it also contains heavy metals which can contaminate soil and seep into water systems. One litre of engine oil can contaminate 2 million litres of water.

Ensure that the garage that services your vehicle participates in a system for collecting and recycling used motor oil, oil filters, and fluids.

Re-refined oil certified with the EcoLogo performs as well as motor oil from original sources, and you should ensure that it is used whenever the oil is changed.

Antifreeze

Never dump radiator antifreeze or coolant down the drain. These substances contain ethylene glycol, which is poisonous to fish, wildlife and people. The sweet taste of the antifreeze attracts animals.

Unwanted antifreeze should be put in a sturdy container and disposed of in an environmentally responsible manner. (Check with your local hazardous waste depot to find out if they will accept institutional waste.) Ensure that the garage that maintains your vehicle participates in a program to collect and recycle antifreeze.

Batteries

Ensure that your garage sends discarded batteries to a battery recycler. Vehicle batteries contain a high percentage of lead, which does not break down in the environment and is toxic to humans and animals. Lead poisoning causes damage to the brain, kidneys and nervous system. Children are particularly susceptible.

Tires

Tires are not considered to be a hazardous or toxic waste unless they are burning. However, tires pose a real problem for waste disposal. When buried, they tend to resurface with the freeze and thaw process of our winters. They also tend to attract small rodents and vermin, and they never decompose. To avoid landfill problems, tires can be recycled.



Using tires as long as possible and recycling them when they are no longer safe are both positive steps for the environment.

To make tires last as long as possible, maintain proper tire pressure, have the tires rotated for even wear, and have the wheel alignment checked if the tread wear is uneven (eg., worn on one side only). Tires will lose one-tenth of their life if regularly underinflated by four pounds per square inch.

Consult with the garage that maintains your vehicles about disposal options in your area for used tires.

Solvents and Cleaning Products

Use pressurized water to wash vehicles and as little soap or detergent as possible. Soap or detergent with no phosphates is best because phosphates can be damaging to our lakes and rivers – they promote the growth of algae which chokes oxygen from the water.

Avoid aerosol cans: manufacturing the cans is energy- and resource-intensive, and they take up space in our landfills.

Try to substitute less harmful alternatives for solvents. When cleaning parts with solvents, use them as sparingly as possible, and be aware that solvents exposed to the air release vapours into the atmosphere.



Endnotes

¹ *Go Green*, B.C. Ministry of Transportation and Highways, 1990.

² *The Car Economy Book*, Natural Resources Canada, 1991.

³ *Operating Practices for Fuel Economy*, Alberta Ministry of Energy and Natural Resources, 1988.

⁴ *What We Can Do For Our Environment*, Environment Canada, 1990.

⁵ *What We Can Do For Our Environment*, Environment Canada, 1990.

⁶ *Car Economy Book*, Natural Resources Canada, 1991.

⁷ *Driving Skills for Fuel Economy*, Alberta Ministry of Energy and Natural Resources, 1988.

Summary

Here's a summary of what you can do to reduce the emissions and wastes that cause environmental problems:

Reduce fuel consumption by

- not making unnecessary trips
- avoiding unnecessary idling
- planning the route and avoiding heavy traffic
- using a block heater in winter
- maintaining correct tire pressure
- maintaining moderate speeds and anticipating the movement of traffic
- removing unnecessary objects from the vehicle

Practise preventive maintenance by

- maintaining the vehicle according to the manufacturer's recommended schedule
- keeping records of the preventive maintenance that is done
- having the exhaust system inspected regularly
- having older vehicles tuned up as required
- maintaining and reviewing fuel-consumption records
- inspecting regularly for leaks

Protect the ozone layer by

- having CFC air conditioners serviced by a garage with equipment to recover the CFCs

Reduce the environmental impact of wastes by

- taking used oil and filters to a service station for recycling
- ensuring that your service station sends used oil and fluids for recycling
- using EcoLogo[®]-certified re-refined oil
- disposing of antifreeze properly; ensuring your garage sends it for recycling
- ensuring that your discarded vehicle batteries and tires are recycled
- maintaining proper tire pressure to prolong the life of the tires

Additional Resources

The Automobile: What We Can Do For The Environment, Environment Canada, 1993.

The Auto Smart Guide, Natural Resources Canada, 1995.

Car Tips for Clean Air: How to Drive and Maintain Your Car to Cut Pollution and Save Money, Robert Sikorsky. Putnam Publishing Corp., New York, N.Y., 1991.

Drive\$ave/Trucksave Catalogue, a listing and description of publications, films and videos available from the Ontario Ministry of Transportation, (Tel: 416-235-5037; Fax: 416-235-4936).

The Environmental Choice[™] Program certified suppliers list and guidelines on re-refined oil, recycled engine coolant and gasoline blended with ethanol (Tel: 613-952-9440).

Environmental Implications of the Automobile - A State of the Environment Fact Sheet, (SOE Fact Sheet No. 93-1), Environment Canada, 1993.

Fuel Consumption Guide, an annual listing of all vehicle models and their fuel consumption ratings by Transport Canada/Natural Resources Canada.

"Green" Driving Tips Visor Sticker, Office of Federal Environmental Stewardship, Environment Canada, 1993.

How you can protect the environment, Environmental Code of Practice for Motorists, Canadian Automobile Association.

A Matter of Degrees: A Primer on Global Warming, Environment Canada, 1993.

The Ozone Layer: What's going on up there?, Environment Canada, 1993.

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Workplace Guide, Harmony Foundation of Canada, 1991.

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