



IDLE-FREE **Teacher's Resource Kit**

A free downloadable resource
to help you **clear away the smoke**
around vehicle exhaust, climate change
health and air pollution

KIT INCLUDES ACTION PLAN TO MAKE YOUR SCHOOL AN IDLE-FREE ZONE!

Contents

<i>Introduction to the Kit</i>	<i>ii</i>
<i>Acknowledgements</i>	<i>ii</i>
Background Information on Idling	1
Idling and Climate Change Go Hand in Hand.....	1
Health Impacts of Idling.....	1
Idling wastes fuel and money.....	2
News flash! Idling is not good for your engine.....	2
19 fast facts about idling.....	3
Grade 4 Lesson Plan	5
Lesson 1: Habitat Destruction in Pacific Coho Salmon.....	5
Grade 5 Lesson Plans	15
Lesson 1: Weather and the Atmosphere.....	15
Lesson 2: Creating carbon dioxide gas from a liquid and a solid.....	17
Lesson 3: Carbon Dioxide and the Greenhouse Effect.....	20
Lesson 4: Fossil Fuels and Our Health/Lung Function.....	24
Grade 6 Lesson Plans	30
Lesson 1: What is Electricity?.....	30
Lesson 2: Renewable and Non-Renewable Energy Sources.....	35
Lesson 3: Decreasing our use of Energy in and around the School.....	45
Action Plan for Creating an Idle-free School	46
Grade 4 Action Plan.....	46
Grade 5 Action Plan.....	47
Making idling observations.....	49
Creating a School-Wide Action Plan.....	49
6th Grade Action Plan.....	50
Key Points for Writing Powerful Letters.....	52
Idle-free Questions.....	53
Measuring Idling Time.....	54
Comparing Idling Times.....	55
Countdown to Reduced Idling.....	56

Introduction to the Kit

Welcome to the Idle-Free Teacher's Resource Kit. This kit is designed to help you introduce big environmental concepts into your classroom and to help you make your school idle-free. We are pleased to have your participation in creating idle-free schools in Nova Scotia's communities.

This kit contains tools for your 4th, 5th and 6th grade classes to learn about idling... and to take action. Each grade has grade-specific lessons that are aligned to the expected outcomes. These lessons provide the teacher with solid background information that will lead your students to a better understanding of the problematic nature of idling and assist you in answering the many questions that your students will have. Once students and teachers understand the importance of having an idle-free school and decide to undertake making the school idle-free, the kit provides ways to implement an action plan for each grade level. The kit also provides links to downloadable posters, information sheets and other support pieces.

Acknowledgements

This kit was prepared by Kyle Schaffhauser for Clean Nova Scotia, 2007.

Clean Nova Scotia wishes to acknowledge and thank the following:

- **Conserve Nova Scotia**, for funding this project;
- **Marilyn Webster** of the Nova Scotia Department of Education for offering insight and guidance;
- **Ron Zima** of The Children's Clean Air Network, for providing idle-free strategies and advice.

Background Information on Idling

Idling and Climate Change Go Hand in Hand

Climate change is a global problem, but a big part of the solution lies in the hands of individuals – including the millions of Canadians who drive vehicles every day.

What exactly is climate change? Scientists have recognized that increasing concentrations of greenhouse gases in the atmosphere are trapping more heat near the earth's surface. This is causing average global temperatures to rise, which, in turn, is triggering changes in climate. We're already seeing the early impacts of climate change in Canada, with severe weather events in some parts of the country and rapidly changing conditions in the North, but it could get much worse. Unless action is taken very soon, climate change could put Canada's forests, water and food supply at risk, endanger plant and animal species, and harm human health.

Human activities, particularly the combustion of fossil fuels, are a major source of greenhouse gas emissions. And Canadians' love affair with the car—we own more of them and drive them farther than ever before—is a big part of the problem. In fact, the transportation sector is the largest source of greenhouse gas emissions in Canada.

For every litre of gasoline used, the average car produces about 2.4 kilograms of carbon dioxide (CO₂), the principal greenhouse gas. This is unavoidable with today's internal combustion engines. But we can avoid producing unnecessary greenhouse gas emissions by reducing or eliminating wasteful vehicle idling.

Emissions from idling vehicles can be easily prevented – all it takes is the turn of a key.

If every driver of a light-duty vehicle in Canada

avoided idling for just five minutes a day, we would prevent more than 1 million tonnes of CO₂ from entering the atmosphere each year. That would represent a significant contribution to Canada's climate change efforts.

Health Impacts of Idling

Carbon dioxide is only one by-product of fuel combustion – the vehicles Canadians drive every day also generate other toxic substances that are fouling our air, contributing to urban smog and threatening our health.

Studies by Health Canada and community health departments and agencies have shown a direct link between contaminants in vehicle emissions and significant respiratory health effects. These studies have concluded that poor air quality and smog – caused in part by vehicle exhaust – are resulting in increased hospital admissions, respiratory illnesses and premature deaths, particularly in urban areas.

In fact, Health Canada estimates that more than 5000 Canadians die prematurely each year because of air pollution, and thousands more become unnecessarily ill. Children are particularly vulnerable to air pollution because they breathe faster than adults and inhale more air per kilogram of body weight. Air pollution also causes unnecessary difficulty for elderly people and those with respiratory problems, such as asthma, emphysema and chronic bronchitis.

These health problems could become even more common and pronounced as climate change progresses. That's because climate change results in more frequent and severe heat waves, which tend to make smog and air pollution worse. One way to head off the problem is to stop unnecessary idling. Our air would be cleaner, and respiratory health would improve in our communities.



Idling wastes fuel and money

One of the most powerful arguments in favour of reduced idling is an economic one. Unnecessary idling wastes fuel – after all, idling gets us nowhere – and wasted fuel is wasted money.

Many Canadian fleet operators have implemented idling policies to reduce their fuel costs and improve their competitiveness. (In some heavy-duty vehicles, electronic engines can be programmed to shut down after a certain period of idling.) With today's high fuel prices, individual Canadians might be well-advised to consider adopting a personal idling policy.

If every driver of a light duty vehicle avoided idling five minutes a day, collectively, we would save 1.8 million litres of fuel, almost 4500 tonnes of GHG emissions, and \$1.7 million in fuel costs *every day* (assuming fuel costs of \$0.95/L).

There is ample opportunity to achieve that goal. Research indicates that Canadian motorists idle their vehicles an average of 5 to 10 minutes a day. One study suggests that in the peak of winter, Canadians voluntarily idle their vehicles for a combined total of more than 75 million minutes a day – equivalent to one vehicle idling for 144 years! We idle about 40 percent less in summer, but it still amounts to an enormous waste of fuel and money.

There's another issue to consider. Gasoline is derived from crude oil, a non-renewable resource. We're not in danger of running out in the near future, but crude oil reserves in Canada and around the world are dwindling – why waste this precious resource?

To sum up, gasoline is costly, its use has significant environmental impacts, and there's not an endless

supply – three good reasons not to waste fuel through unnecessary vehicle idling.

News flash! Idling is not good for your engine

Perhaps the greatest myth about idling is that it's good for the engine. The truth is that excessive idling can actually damage a vehicle's engine.

Contrary to popular belief, idling is not an effective way to warm up a vehicle, even in cold weather. The best way to do this is to drive the vehicle. Today's electronically controlled engines allow you to drive away after only 30 seconds of idling, even on the coldest winter days, so as soon as your windows are clear, you can go!

Excessive idling can be a problem for a few reasons:

- First, since an idling engine is not operating at its peak temperature, fuel combustion is incomplete.
- As a result, fuel residues can condense on cylinder walls, contaminate oil and damage engine components. For example, these residues tend to deposit on spark plugs. With more engine idling there is a drop in the average plug temperature and accelerated plug fouling. This can increase fuel consumption by 4 to 5 percent.
- Excessive idling can cause water to condense in the vehicle's exhaust. This can lead to corrosion and reduce the life of the exhaust system.

There's another good reason for motorists to drive away soon after starting a vehicle. The engine is only one component of a vehicle. Other parts, such as the wheel bearings, steering, suspension, transmission and tires, also need to be warmed up, and the only way to do that is to get the vehicle moving.

Another common misconception is that it's better to let an engine idle than to continually shut off and restart the vehicle. Research has shown that frequent restarting has little impact on engine components such as the battery and starter motor. Component wear caused by restarting is estimated to add \$10 per year to the cost of driving, money that can be recovered several times over in fuel savings from reduced idling.



19 fast facts about idling

Idle-Free Teacher's Resource Kit

1. Idling gets you nowhere—and it can be costly. Excessive idling wastes an enormous amount of fuel and money and generates needless greenhouse gas (GHG) emissions.
2. If every driver of a light-duty vehicle in Canada stopped idling for just five minutes a day, collectively we would save 680 million litres of fuel per year. We would also prevent more than 1.6 million tonnes of carbon dioxide—the main GHG—from entering the atmosphere annually.
3. In winter conditions, emissions from an idling vehicle are more than double the normal level immediately after a “cold start”.
4. Warming up the vehicle means more than warming the engine. The tires, transmission, wheel bearings and other moving parts also need to be warmed up for the vehicle to perform well. Most of these parts don't begin to warm up until you drive the vehicle.
5. With computer-controlled, fuel-injected engines, you need no more than 30 seconds of idling on winter days before driving away. Contrary to popular belief, the best way to warm up your vehicle is to drive it.
6. Exhaust fumes from idling contain many noxious gases that are bad for our health. Children are most at risk because they breathe faster than adults. Health Canada estimates that more than 5000 Canadians die prematurely each year because of air pollution, and thousands more become unnecessarily ill.
7. Poor air quality and smog—caused in part by vehicle exhaust—cause increased hospital admissions, respiratory illnesses and premature deaths, particularly in urban areas.
8. Ten seconds of idling can use more fuel than turning off the engine and restarting it. If you're stopped for more than 10 seconds—except in traffic—turn off the engine.
9. Every 10 minutes of idling costs you at least one fifth of a litre in wasted fuel – and up to two fifths of a litre if your vehicle has an eight-cylinder engine. Keep in mind that every litre of gasoline you use produces 2.4 kilograms of carbon dioxide.
10. Excessive idling is hard on your engine. Because the engine isn't working at peak operating temperature, fuel doesn't undergo complete combustion. This leaves fuel residues that contaminate engine oil and make spark plugs dirty.

cont'd over -->



Idle-Free Teacher's Resource Kit

11. Restarting a car many times has little impact on engine components such as the battery and the starter motor. The wear on parts that restarting the engine causes adds about \$10 a year to the cost of driving – money you can recover several times over in fuel savings.
12. It's important to drive away as soon as possible after a cold start, while avoiding high speeds and rapid acceleration for the first five kilometres. This allows the whole vehicle to reach peak operating temperature as quickly as possible without paying a fuel penalty.
13. If your vehicle has a diesel engine, idling actually lowers the coolant temperature faster than shutting off the engine. In other words, switching off the engine keeps the engine warm longer.
14. A poorly tuned engine uses up to 15 percent more energy when idling than a well-tuned vehicle. Keeping your vehicle in good condition is a key to fuel efficiency and reduced GHG emissions.
15. Use a block heater to warm your engine more efficiently and effectively than idling. A block heater warms the engine block and lubricants, which makes the engine start more easily and reach its peak operating temperature faster.
16. You don't need to leave a block heater plugged in overnight to warm the engine —two hours is more than enough. Use an automatic timer to switch the heater on two hours before you leave.
17. Idling your vehicle with the air conditioner on (to keep the interior cool) can increase emissions by 13 percent.
18. A recent study suggests that in the peak of winter, Canadians voluntarily idle their vehicles for a combined total of more than 75 million minutes a day – equal to one vehicle idling for 144 years. We idle about 40 percent less in summer, but still waste an enormous amount of fuel and emit unnecessary pollution.
19. Warming up a vehicle is the most common reason given for idling—in both winter and summer! Canadians also say that they often idle while sitting in the drive-through lane of a fast-food restaurant or while waiting for someone.