WORKING WITH
PARTNERS TO ACHIEVE
CLEAN AIR

The Clean Air PARTNERSHIP

Actions Being Taken by GTA-CAC Municipalities to Reduce Emissions From Municipal Vehicles

Prepared on behalf of and with the support of the
Greater Toronto Area Clean Air Council

September 2007

GTA CleanAir COUNCIL

CLEAN AIR PARTNERSHIP 75 Elizabeth Street Toronto Ontario M5G 1P4
Telephone 416.392.6672 Fax 416.338.0616 Email cap@cleanairpartnership.org Website www.cleanairpartnership.org

Executive Director:
Eva Ligeti, Clean Air Partnership

Researcher and Author:
Michael Canzi, Manager of Government Programs, Clean Air Partnership

Editor:
Chris Hill, Manager, Central Fleet , City of Hamilton

CAP would like to thank the member agencies of the Greater Toronto Area Clean Air Council for their generous funding of this research, as well as the City of Toronto and the Toronto Atmospheric Fund for their ongoing financial support.

For more information, contact:
Clean Air Partnership
75 Elizabeth Street
Toronto, Ontario M5G 1P4
Canada
416-392-6672
www.cleanairpartnership.org

Additional copies of this publication may be downloaded from our website,
http://www.cleanairpartnership.org

About the Clean Air Partnership
The Clean Air Partnership (CAP) is a registered charity that works in partnership to promote and coordinate actions to improve local air quality and reduce greenhouse gases for healthy communities. Our applied research on municipal policies strives to broaden and improve access to public policy debate on air pollution and climate change issues. Our social marketing programs focus on energy conservation activities that motivate individuals, government, schools, utilities, businesses and communities to take action to clean the air.

Table of Contents

Executive Summary

In the spring of 2007, the Clean Air Partnership (CAP) undertook a study of the member municipalities of the Greater Toronto Area Clean Air Council (GTA-CAC) to determine what actions have been taken to reduce the emissions associated with municipal off-road equipment and heavy-duty fleets. Information volunteered by the municipalities about their light-duty fleets was also tracked and is reported, but was not a major focus of the research.

From the responses CAP received to its paper survey and telephone and e-mail contact, it is clear that GTA-CAC municipalities have experience with a wide range of emission reduction strategies. In fact, in many ways, GTA-CAC municipalities are taking a leadership role in reducing emissions from motor vehicles. Several are using on-road, ultra-low sulphur diesel in off-road vehicles, for example, bettering the minimum standards set for them by the federal government. Others are piloting new technologies, such as hydrogen fuel enhancement and plug-in hybrids, stretching well above and beyond the simple role of service provider. Yet others have prepared carefully-considered plans to right-size the vehicles in their fleets over time.

Among the most commonly-cited emission reduction strategies currently in use are:

- adoption of anti-idling policies or by-laws (15 of 16 municipalities/agencies);
- use of hybrid electric vehicles (14);
- use of bio-diesel (11);
- measurement and reporting of fuel consumption (11); and
- use of aftermarket fuel additives and devices (11).

However, aside from bio-diesel, which is used in most or all vehicles in at least 7 jurisdictions, the more technologically-based strategies examined in this report seem to have had a limited deployment thus far. While 14 municipalities reported that they are using hybrid electric vehicles, for example, hybrids as a proportion of the total municipal fleet are quite small. Similarly, while 8 municipalities reported that they are using idle-reduction technologies, such as in-cab heaters and automatic shut-down/start-up systems, these devices are actually being used in a small number of vehicles.

Reasons for the limited deployment of emission-reducing technologies are many. For one thing, attention has only been focused on the subject for a relatively short period of time, and it will naturally take a while to replace existing, more-polluting technologies and behaviours with newer, less-polluting ones. This is not simply due to competing priorities and a lack of resources, as several survey respondents noted, but also due to the relative immaturity of the technologies in question: survey respondents repeatedly mentioned the reluctance of engine manufacturers to honour warranties when unproven aftermarket products (and certain grades of bio-diesel) are used in their engines.

The scarcity of data about the impacts of these technologies and other, more behavior-based, emission reduction strategies is troubling. While most survey respondents were able to offer opinions about the effectiveness of the strategies with which they had experience, very few of them were able to provide evidence supporting their points of view. As some noted, municipalities do not have the staff and technology necessary to conduct rigorous before-and-after studies of emission reduction strategies. Without these data, however, it is difficult to convince engine manufacturers to honour their warranties when the strategies are used, and difficult for municipalities to make informed choices about which strategies would be the most cost-effective to pursue. This in turn, will limit the amount by which emissions are ultimately reduced.

With this information in mind, CAP makes the following recommendations:

a) That the GTA-CAC supports CAP in researching and communicating existing data that quantify the environmental and health impacts and economic costs and benefits of implementing emission reduction strategies, from GTA-CAC municipalities and beyond; and
b) That the GTA-CAC work with CAP to identify and secure funding for before-after-studies of the impacts of various emission reduction strategies in GTA-CAC municipalities: a pilot project using idle reduction technologies, for example.

With an improved knowledge base to work from, GTA-CAC municipalities will be able focus and accelerate their progress in reducing emissions from municipal vehicles, improving air quality and public health, and building political support.

1. Introduction

The Clean Air Partnership (CAP) is a registered charity that works to promote and coordinate actions to improve local air quality and reduce greenhouse gases. One CAP initiative is the Greater Toronto Area Clean Air Council (GTA-CAC), an intergovernmental working group that promotes increased awareness of regional air quality issues and the reduction of air pollution emissions in the Greater Toronto Area through the collective efforts of all levels of government. Every year, elected officials of GTA-CAC member jurisdictions sign a declaration committing the GTA-CAC to action in a limited number of specific areas during the following twelve months. Under article 3.6 of the *Toronto and Region 2006 Inter-Governmental Declaration on Clean Air*, the signatories committed to "Review[ing] and assess[ing] the actions being taken by municipal partners in the GTA-CAC to reduce emissions associated with off-road equipment and heavy-duty vehicles in the corporate fleets."

To that end, CAP developed a survey, with input from Chris Hill, Manager, Central Fleet for the City of Hamilton and Drew Shintani then-Business Development and Improvement Analyst, Fleet Services for the City of Toronto. The survey was distributed by e-mail to the fleet managers of GTA-CAC municipalities in March 2007. Thereafter, telephone interviews were conducted with selected survey respondents to gather more detailed information.[1] This report is a summary of the information gathered by these means and augmented with a limited literature review, including responses to CAP's five-year review of municipal actions arising from the annual *Inter-governmental Declaration on Clean Air*. This report is not an exhaustive examination of the subject matter: for the most part, only information that was volunteered was used.

This research shows that GTA-CAC municipalities have used and continue to use a large number of varied strategies to reduce the emissions associated with their vehicles. Table 1 indicates the types of strategies with which the municipalities have experience and the municipalities that reported experience with these strategies. Details about each of these types of strategies, and others, as well as the municipalities' experiences with them, are provided in sections 2 through 13 of this report. Section 14 summarizes the research and includes recommendations arising from it. Links to supplementary sources of information are provided thereafter.

[1] Though the focus of the research was emission reductions in off-road and heavy-duty vehicles, information was also volunteered about light duty vehicles.

Table 1. GTA-CAC Municipalities Reporting Experience with Fleet Emission Reduction Strategies

	Emission Reduction Technology	Idling Reduction Technology	Anti-Idling Policy	Operator Training	Alternative Vehicles[a]	Right-Sizing	Bio-diesel	Ethanol	Other Alternative Fuels	Measurement and Reporting	After-market Products	Language	Emission Reduction Credits
Burlington		✓	✓[b]	✓	5[e]	✓	✓		✗[c]	✓		✓	
Caledon			✓	✓	1	✓	✓	✓		✓	✓	✓	
Durham[kp]											✓[m]		
Halton			✓	✓	2		✓			✓	✓		✓
Hamilton		✓	✓		56[f]		✓	✓	✓[g]	✓	✓[m]	✓	
Markham		✓	✓[b]	✓	9	✓[h]	✓	✓		✓	✓	✓[i]	
Mississauga			✓	✓	24[j]	✓				✓	✓	✓	
Oakville[p]			✓[b]		4						✓[n]		
Oshawa	✓[i]	✓	✓[b]	✓	2		✓			✓	✓		
Peel		✓	✓	✓	9		✓		✗[l]	✓	✓		
Pickering			✓[b]		1	✓							
Richmond Hill		✓	✓		6		✓	✓		✓	✓		
Toronto[d]	✓	✓	✓	✓	81[q]	✓[h]	✓	✓	✓[r]	✓		✓	✓
Toronto[k]	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	
Vaughan			✓		1	✓					✓		
Whitby			✓										

Notes: a = light duty gasoline-electric hybrids unless otherwise specified. b = stand alone by-law. c = no longer using compressed natural gas (CNG). d = corporate fleet only. e = ***plus*** one regenerative air street sweeper. f = ***plus*** 12 diesel-electric hybrid buses and 15 regenerative air street sweepers. g = CNG used in 100 buses. h = includes Smart Car(s). i = planned but not yet implemented. j = ***plus*** electric off-road vehicles. k = transit fleet only. l = no longer using propane in police vehicles. m = hydrogen enhancement system installed on some vehicles. n = pilot of hydrogen enhancement system planned but not yet implemented. p = partial response. r = natural gas used in 138 pick-up trucks. q = ***plus*** fourteen regenerative air street sweepers and two plug-in hybrids. ✓ = currently in use. ✗ = used in the past

2. Emission Control Devices

Emission control devices, diesel particulate filters or diesel oxidation catalysts, for example, remove particulate matter (PM), hydrocarbons (HC), carbon monoxide (CO), and (indirectly) nitrogen oxides (NO_x) from the exhaust of diesel engines. These devices can be installed upstream of, or integrated into, a vehicle's muffler and are very effective at reducing emissions.[2]

Of the municipalities and municipal agencies responding to the two CAP surveys,[3] only Toronto and the Toronto Transit Commission (TTC) reported any experience with emission control devices. However, delivery of vehicles incorporating these technologies is expected in the near future in both Markham (two fire trucks) and Oshawa (six snow plows).

Among the respondents whose fleets already use these technologies, opinion was split as to whether they are having a significant impact on emissions. It is not clear if this is simply due to the limited number of devices currently in use, the performance of those devices, a lack of data, or a combination thereof.

3. Idle Reduction Technologies

Idle reduction technologies, like in-cab heaters, automatic shut-down/start-up systems, and auxiliary power units, allow vehicle operators to use their vehicles while they work without idling their engines. The impact of idle reduction technologies on emissions is indirect: by reducing the amount of fuel consumed, they reduce the emissions associated with fuel consumption.

Eight GTA-CAC municipalities/municipal agencies reported that they are currently using idle reduction technologies in heavy duty or off-road vehicles: Burlington, Hamilton (three vehicles), Markham, Oshawa, Peel, Richmond Hill, Toronto and the Toronto Transit Commission.

3.1 In-cab Heaters

In-cab heaters generate heat for the cabins of vehicles by tapping into the vehicle's fuel supply, but by-passing its engine. The heat is generated using a fraction of the fuel that would be used by idling a vehicle's engine to produce cab heat. In fact, Laurie Canning,

---

[2] Kim Perrotta, *School Buses, Air Pollution & Children's Health: Improving Children's Health & Local Air Quality by Reducing School Bus Emissions*, Ontario Public Health Association, 2005. Accessed from: http://www.cleanairpartnership.org/pdf/school_buses_children.pdf.

[3] Both the *Scan of Practice with Off-Road and Heavy-Duty Fleet* and the review of municipal actions arising from the annual *Inter-governmental Declaration on Clean Air*.

Fleet Manager for Markham, estimated that a Diesel-powered in-cab heater uses 1/8 as much fuel as a vehicle engine to create the same amount of heat.

Both Markham and Toronto reported having experience with in-cab heaters. Markham reported that it has used in-cab heaters in two snow plows in each of the past two winters. The impacts of the devices on fuel consumption and emissions were characterized as significant. Before the installation of the devices, the plows would idle for two hours in the morning to warm up. Now, with in-cab heaters, they are ready for use in two minutes. The heaters cost $1,500 apiece, but are expected to pay for themselves through reduced fuel consumption in 3 to 5 years.

In-cab heaters have been a trouble-free emission reduction strategy for Markham. In fact, Canning would like to install more, particularly in the off-road tractors the Town uses to move snow at arenas.[4] However, he noted, the discontinuation of federal rebates for these devices are an impediment to their further implementation.

3.2 Automatic Shut-down/Start-up Systems

Automatic shut-down/start-up systems manage the shutdown and restart of vehicles while parked and idling, continually monitoring existing conditions and comparing them against a pre-programmed set of on/off values. The devices can be programmed to shut down or restart a vehicle when the ambient air temperature within the vehicle is outside a specified range, allowing the vehicle to idle only when there is a need for heat or air conditioning.

Three jurisdictions reported ongoing experience with automatic shut-down/start-up systems: Burlington, Oshawa (all refuse vehicles, two street sweepers and five snow plows) and Peel (new solid waste roll-off trucks).

Because there is no baseline data for the vehicles in question, Lynne Germaine, Manager, Operations Support for Peel, was unable to estimate what impact the devices have had on fuel consumption and emissions in her jurisdiction. However, she did note that some devices can be over-ridden by vehicle operators. If a vehicle operator keeps their foot on the brake, for example, the device will not necessarily detect lack of movement as idling; and idling a vehicle without putting a vehicle into park is a safety risk.

[4] These vehicles, which only need to be on for brief periods of time, are often idled to keep them warm because they are stored outdoors.

3.3 Low Wattage Vehicle Lights

High-efficiency, low wattage lights—light emitting diodes (LEDs), for example—draw less power than incandescent or fluorescent bulbs, so there is less of a need to idle a vehicle's engine at a work site to keep its batteries charged.

Both Markham and Richmond Hill reported that they are using low voltage lighting fixtures in their vehicles. In fact, according to Rodney Young, Fleet Supervisor for Richmond Hill, the Town has been using LED lights and auxiliary batteries in its vehicles for ten years. They were installed first in vehicles where they were an obvious improvement: trucks carrying directional arrow boards, for example, which contain a lot of lights.

3.4 Auxiliary Batteries (and Solar Power)

Auxiliary batteries can be installed in vehicles to augment the vehicles' starter batteries. Where auxiliary batteries are used instead of starter batteries to power peripherals, such as communications devices, four-way flashers, arrow boards and rotating lights, starter batteries are not drained and there is no need to idle a vehicle to recharge them. Solar-powered versions of some of these peripherals are also available.

Aside from Richmond Hill, whose experience using auxiliary batteries is recounted in Section 3.3 above, and Toronto, which uses them to power tools such as grinders and drills, no other municipality reported experience with this technology.[5] One other survey respondent acknowledged an awareness of auxiliary batteries, but noted that there isn't always enough room in a vehicle to accommodate them.

3.5 Indoor Storage

One survey respondent suggested that idle reduction technologies aren't as important, and that idling is less of an issue, when vehicles are stored indoors. In these circumstances, vehicles will be relatively warm in the morning and there will be less of a perceived need to idle them to warm them up.

3.6 Automatic Vehicle Locator (AVL) Technology

One jurisdiction expressed a preference for deploying Automatic Vehicle Locator (AVL) technology *before* any idle reduction technologies. AVL equipment can be used to gather data about the amount of idling currently occurring, and these data can be used in comparisons of idling before and after the deployment of idle reduction technologies. Accurate before/after comparisons of fuel consumption in vehicles with idle reduction tech-

[5] It is known that Toronto Hydro uses these devices in its vehicles, however.

nologies are the best way to determine whether these technologies are a cost-effective strategy for reducing emissions.

The effectiveness of AVL technology was demonstrated for heavy-duty truck fleets participating in the 2005 Repair Our Air Fleet Challenge, which engaged fleets in an idling reduction effort. The most effective solutions used daily AVL reports of idling provided to the drivers, which showed reductions of up to 90% in idling time.

The City of Toronto is currently using AVL technologies to monitor idling.

4. Anti-idling Policies for the Municipal Fleet

Six municipalities reported that they have anti-idling policies for municipal fleets: Caledon, Halton, Peel, Richmond Hill, Toronto and Vaughan. A seventh municipality, Hamilton, is reportedly developing a policy.

Under Peel's *Vehicle and Equipment Idling Policy*, adopted in 2003 and attached to this report as Appendix A, idling of vehicles and equipment owned, leased or rented by the Region of Peel is limited to one minute, with the following exemptions:

a) For vehicle/equipment maintenance and diagnostic purposes;
b) Under extreme weather conditions or any other time when the health and safety of employees or others may be jeopardized;
c) If the unit is not expected to restart due to mechanical problems (to be repaired ASAP);
d) Assisting on an emergency scene; and
e) When the engine is required to power auxiliary equipment (i.e.: hoist, life, computers, safety lighting and internal equipment).

Peel's policy includes instructions for operators and supervisors alike to ensure that vehicle deficiencies are reported and dealt with promptly, so that vehicles aren't idled out of fear of not being able to restart them.

Toronto's *Idle-Free Policy*, adopted in 2007 and attached to this report as Appendix B, limits idling to 10 seconds except in operational situations and during warm-up. The policy includes guidelines for warm up periods, ranging from a low of 10 seconds for gasoline-powered light-duty vehicles in above-zero weather, to a high of 3 to 5 minutes for heavy duty vehicles and equipment in all weather conditions.

Under Halton's policy, which was adopted in 2006, EMS and police vehicles are exempt because of their need to have flashing lights on at night. Caledon's policy applies only to vehicles in the Public Works and Engineering department.

Both Peel's and Toronto's policies warn that non-compliance by drivers/operators may result in disciplinary action. Complaints about City of Toronto drivers are brought to the attention of the driver's supervisor whose responses may include sending the driver for retraining or pursuing other disciplinary actions.

Both Peel and Toronto described coordinated, multi-pronged approaches to familiarizing their staff with the policies. In Peel, anti-idling decals are placed on the dash of all Regional vehicles; anti-idling pamphlets are left in Regional vehicles when they are serviced; and signage promoting reduced idling is posted at key locations within the Region's Public Works facilities. In Toronto, the Director of Fleet Services makes early morning presentations to staff at their yards/garages, anti-idling banners are displayed and decals and key chains are circulated. Similarly, Halton reported that its policy is not enforced, but that reminders are frequently issued to staff.

While opinion was split on the effectiveness of anti-idling policies, there was no indication of any evidentiary basis for either point of view. In other words, no jurisdiction reported having taken before-and-after measurements of idling among staff to analyze the impacts of its anti-idling policy.

Several GTA-CAC municipalities—including Burlington, Markham, Oakville, Oshawa and Toronto—are known to have anti-idling by-laws. Similar in intent to anti-idling policies, these by-laws regulate the behaviour not only of municipal staff but of citizens, as well. The 2005 CAP report, *Cracking Down on Idling: A Primer for Canadian Municipalities on Developing and Enforcing Control By-laws*,[6] includes a discussion of the strengths and weaknesses of these by-laws. An evaluation of the results of the Idle Free pilot project will also be available via the CAP website shortly. The report compares the effectiveness of anti-idling education (in Brampton) versus an anti-idling by-law and enforcement (in Markham).

5. Vehicle Operator Training

Nine municipalities and municipal agencies indicated that they provide training to their vehicle operators that includes content about driving in a manner that is energy efficient: Burlington, Caledon, Halton, Markham, Mississauga, Oshawa, Peel, Toronto and the TTC. In most cases, training is provided to a limited number of operators, typically to new recruits. In Markham, however, training is provided for both new and existing operators. Seasonal staff in Markham also receive three days of operator instruction.

---

[6] Jennifer Penney, *Cracking Down on Idling: A Primer for Canadian Municipalities on Developing and Enforcing Control By-laws*, Clean Air Partnership, 2005. Accessed from http://www.cleanairpartnership.org/pdf/cracking_down_on_idling.pdf.

The role of energy efficiency in operator training appears to vary from municipality to municipality. Caledon, Markham and Mississauga reported that their operator training incorporates materials from SmartDriver, a program delivered by driver training organizations across Canada that focuses on behaviours that reduce fuel consumption. More information about the SmartDriver program can be obtained from the website of Natural Resources Canada (NR Can).[7]

Another municipality noted that even though the focus of their operator training is actually defensive driving, it is still beneficial because defensive driving practices improve energy efficiency, as well.

As to whether vehicle operator training is effective at reducing fuel consumption and emissions, opinion was divided, with two municipalities reporting that its impacts were significant, but three reporting that its impacts were insignificant. There was no indication from any GTA-CAC municipality that before-and-after studies had been done to quantify the impacts of training on fuel consumption. In fact, one municipality noted that no baseline data exists against which progress could be measured. And, while a City of Edmonton case study summarized on the NR Can website notes that an 11% decrease in fuel consumption was experienced after operators received on-road training, this occurred on a fixed course and not during regular operations.[8]

6. Alternative Vehicles

Quite a number of GTA-CAC municipalities reported experience with the use of alternative vehicles as a means to reduce emissions. Among the types of alternative vehicles reported on were diesel- and gasoline-electric hybrids, regenerative air street sweepers, electric off-road utility vehicles, and plug-in hybrids. No municipality reported the use of bicycles in its fleet, but it is known that the Toronto Police Force uses a large fleet of bicycles.

6.1 Diesel- and Gasoline-Electric Hybrids

Three municipalities and/or municipal agencies reported using diesel-electric hybrids: Hamilton, with 12 buses, the City of Toronto, and the TTC. As to why the deployment of diesel-electric hybrids isn't more widespread, one respondent noted that other than buses, there aren't any heavy duty diesel-electric hybrids on the market at present.

---

[7] Natural Resources Canada, *What every SmartDriver should know*, 2005. Accessed from http://www.oee.nrcan.gc.ca/transportation/business/smartdriver/sd-info.cfm?attr=20.

[8] Natural Resources Canada, *Driver training program saves money, helps the environment*, 2004. Accessed from http://www.oee.nrcan.gc.ca/transportation/business/documents/success-stories/municipal-edmonton.cfm?attr=16.

Most GTA-CAC municipalities reported that their *light duty* fleets include some gasoline-electric hybrids. The number, makes and models of these vehicles are detailed in Table 2, below.

Table 2. Light Duty Gasoline-Electric Hybrids in GTA-CAC Municipal Fleets

	Ford Escape	GMC Sierra Pickup	Honda Civic	Toyota Prius	Toyota Camry	Other*
Burlington **			2	1	1	1
Caledon				1		
Halton	2					
Hamilton	34		1	10		11
Markham	7		1	1		
Mississauga					12	
Oshawa						2
Peel			***	***		
Pickering	1					
Richmond Hill	4		2	***		
Toronto	2	32	24	3		20
TOTAL	**49**	**32**	**30+**	**16+**	**13**	**34**

* = Includes Chevrolet Silverado pickups, Toyota Highlander SUVs, Saturn Vue SUVs and others, ** = number(s) and type(s) not specified, *** = number not specified

In absolute numbers, few hybrids are currently in use at GTA-CAC municipalities. However, there are plans to increase these numbers in the coming years. In Peel, for example, the plan is to replace gasoline-fueled compact cars with hybrids as the existing vehicles are retired.

Where gasoline-electric hybrids *are* in use, they tend to be deployed for by-law enforcement (Caledon, Markham, Peel and Richmond Hill), meter reading (Mississauga, Peel and Richmond Hill), and building inspection (Hamilton). Hybrids with regenerative braking are most appropriate for applications like these that involve frequent stops and starts, because braking generates electric power, recharging the vehicle's battery. The benefits of hybrids for long-haul, highway driving are more limited.

The purchase price of hybrids is higher than that of comparable diesel- or gasoline-powered vehicles, however one survey respondent noted that federal and provincial rebates worth a combined total of $4,000 per vehicle are available to those who purchase hybrids. Furthermore, the operating costs of hybrids appear to be lower than those of conventionally-fuelled vehicles. Estimates of the fuel economy of Ford Escape hybrids among the survey respondents ranged between 5.5 and 10 litres per 100 km. This com-

pares very favourably with the fuel economy of the vehicles the Escapes are replacing, estimates of which ranged between 12 and 22 litres per 100 km.[9]

Another benefit of hybrid vehicles is that because they use less fuel, they need to be taken off the road and refueled less often. From October through December of 2006, Mississauga's fleet of twelve hybrids required 340 fewer refueling stops than would have the same number of conventionally-fuelled vehicles with the same assignment. This represents a considerable improvement in operating efficiency.

Improved fuel economy and increased operating efficiency notwithstanding, the lower operating costs of hybrid vehicles may not always compensate financially for their elevated purchase prices. Chris Hill, Manager, Central Fleet for Hamilton, speculates that for municipal vehicles driven less than 15,000 or 20,000 km per year, the value of the fuel *not* consumed because of hybrid technology will never equal the premium paid for that technology. However, for vehicles that are used more heavily, like a transit inspector's vehicle (which is on the road 20 hours a day), the expected payback period is 3 years.

Richmond Hill reported that they had to replace the transmission in one hybrid vehicle, which was unexpected, but that they haven't had to replace battery pack yet. No other operational problems were reported.

6.2 Regenerative-Air Street Sweepers

Three GTA-CAC municipalities reported that they have regenerative-air street sweepers in their fleets: the City of Toronto took delivery of fourteen of these vehicles in July 2006, with expected delivery of eleven more in 2007; Hamilton reported that there are seventeen of these vehicles in its fleet; and Burlington reported that it has one.

The impacts of regenerative-air street sweepers on emissions are indirect in that they remove more and re-suspend less fine road dust (i.e. PM) than older, mechanical street sweepers. The City of Toronto estimates that the use of these vehicles improves ambient air quality at "nose-level" along arterial routes by 21%.[10]

Among the other benefits associated with regenerative-air street sweepers: sweeping can even occur during smog days because it does not exacerbate air quality; and toxic loads are prevented from being washed down catch-basins because the sweepers are so effective.

---

[9] Fuel economy data for a wide range of vehicles is available from the Natural Resources Canada website at http://oee.nrcan.gc.ca/transportation/tools/fuelratings/ratings-search.cfm?attr=8.

[10] Nazzareno A. Capano, *Clean Roads to Clean Air Program* (Presentation at the 2006 Smog Summit), City of Toronto, 2006. Accessed from http://www.cleanairpartnership.org/pdf/ss06/naz_capano.pdf.

Though the price differential between mechanical and "dustless" regenerative-air street sweeper is approximately $100,000 per unit, the City of Toronto expects full recovery on the differential cost of the new sweepers in 3.5 years because of their reduced need for repairs.

6.3 Other, including Electric and Plug-in Hybrid Vehicles

Mississauga reported that it has several electric off-road utility vehicles in its fleet, used primarily for transporting grounds-keeping staff and equipment.

As federal funds for the necessary converter are no longer available, the pilot of a diesel-electric hybrid garbage packer planned by the City Toronto is on hold. Toronto is running a pilot program with plug-in hybrid technology in two vehicles, however.

7. Right Sizing

Emissions from municipal vehicle fleets can also be reduced through right-sizing: i.e. the elimination of unnecessary vehicles, and the purchase of smaller, more fuel-efficient vehicles.

Several GTA-CAC municipalities—Burlington, Caledon, Markham, Mississauga, Pickering and Toronto—reported experience with right-sizing as an emission reduction option. For its part, Pickering reported replacing a number of 6-cylinder vehicles with 4-cylinder vehicles. Similarly, Markham reported using a Smart Car, which burns a low 4.2 litres of diesel per 100 km, for Fire Department promotional purposes.[11] There are also 25 Smart Cars in the City of Toronto's corporate fleet.

Mississauga was the sole jurisdiction to report having a formal right-sizing program, under which 113 light duty vehicles will be replaced by smaller, more fuel efficient vehicles between 2006 and 2011. Mississauga estimates that its program will reduce GHG emissions by approximately 548 tonnes over the five-year period, while simultaneously reducing capital costs by $227,000 and fuel costs by $446,000.[12]

Less formally, the Fleet Manager in Burlington reported that he tries to right-size from pick-ups to smaller vehicles as a matter of course. To that end, he asks prospective users if they will need to carry equipment and/or to hop curbs before new vehicles are ordered for them and, if not, he provides them with information about smaller vehicles. But, he noted, he does not have the authority to make vehicle choices for other departments.

---

[11] The vehicle has an on-board inverter which allows its lights to operate via alternating current, obviating the need to idle to keep the battery charged.

[12] Martin Powell (Commissioner of Transportation and Works), *City Fleet Emissions Reductions Study*, City of Mississauga, 2006. Accessed from http://www.mississauga.ca/file/COM/GreenFleetReport.pdf.

Another barrier to right-sizing was reported: namely, the physical size and flexibility of the people who would use smaller vehicles. As explained by one respondent, by-law enforcement is typically provided by larger, older men who have difficulty getting into and out of smaller vehicles.

8. Fuel Switching

Fuel switching is the replacement of higher-emission fuels with lower-emission alternatives. Fuel switching can take many forms: from off-road diesel to lower-sulphur on-road diesel, for example, or from straight petroleum diesel to various mixtures of petroleum diesel with bio-diesel. Most GTA-CAC municipalities responding the survey reported experience with fuel switching.

8.1 On-Road Diesel in Off-Road Applications

Six GTA-CAC municipalities—Burlington, Markham, Mississauga, Richmond Hill, Toronto and Vaughan—reported that they are using on-road, ultra low sulphur diesel (ULSD) in their off-road vehicles. Markham and Richmond Hill use clear on-road diesel in their off-road vehicles, while Burlington, Mississauga and Toronto have the diesel coloured to avoid the provincial tax on clear diesel, which is higher. In 1998, the City of Toronto adopted a policy to purchase on-road diesel fuel for its off-road vehicles.

Emissions are reduced as a result because ULSD contains less than 15 parts per million of sulphur versus a maximum of 500 parts per million,[13] in off-road diesel. According to the respondent from Markham, though the price difference between on-road and off-road diesel isn't great, on-road diesel is a better fuel.

8.2 Bio-diesel

Most GTA-CAC municipalities are using bio-diesel mixes in part or all of their fleets, and some have been doing so for quite a while. Burlington, for example, has been using bio-diesel in off-road vehicles since 2003 and in on-road vehicles since 2004. As is clear from Table 3, below, the percentage of the diesel mix comprised by bio-diesel varies from jurisdiction to the jurisdiction and from season to season. As is also clear from Table 3, and particularly from the responses from Burlington and Halton, where fire and emergency services have not implemented this change, there is still resistance to using bio-diesel from some quarters.

One reason for the remaining resistance to bio-diesel is that it increases in viscosity (i.e. gels) as temperatures fall, clogging filters and fuel lines.[14] Markham found that B50, a

[13] As of June 1, 2007.

[14] This was the reason given for the Burlington Fire Department's rejection of bio-diesel.

fifty-fifty mix of petroleum diesel and bio-diesel, gelled in cold weather. It now uses B5, a mix of 95% petroleum diesel and 5% bio-diesel in colder months, and B20, a mix of 80% petroleum diesel and 20% bio-diesel, in warmer months.

On a related note, Peel reported that in cold weather, as the viscosity of the bio-diesel increases, pumping speed decreases, pumping time increases, and dispensing system filters have to be changed more frequently because of clogging. Despite this, it still characterized its experiences with bio-diesel as positive.

Temporary mechanical problems associated with bio-diesel use were also reported by Richmond Hill and Halton. Richmond Hill, which has been using bio-diesel since 2003, found that when bio-diesel was first introduced into its main fuel tank, it absorbed water residue, and filters had to be replaced more often than usual. However, it also reported that this is no longer an issue. Similarly, Halton found that injector pumps in some older vehicles burned out when using bio-diesel, but noted that this is not a problem with newer vehicles.

Table 3. Bio-diesel Use in GTA-CAC Municipal Fleets

	B5	B10	B20	B50
Burlington – off-road			May, Jun, Sep	Jul and Aug
Burlington[a] – on-road	May to Sep			
Caledon – off-road		[d]	[f]	
Halton[b]			Winter	Summer
Hamilton[c]	Apr to Sep			
Markham[c]	Sep to Apr		Apr to Sep	
Oshawa[c]		All seasons		
Peel[d]	Dec and Jan	Feb and Mar	Apr and May[e]	
Richmond Hill[c]	Nov - Apr		Other months	
Toronto	All seasons			

Notes: [a] All on-road and off-road vehicles, with the exception of the Fire Department Fleet. [b] All on-road and off-road vehicles, with the exception of the Emergency Medical Services fleet. [c] All on-road and off-road vehicles. [d] In a limited number (12-16) of vehicles. [e] Pilot project conducted in April and May, 2007. [f] Sidewalk snow clearing machines, turf mowers and tractors.

Expense is another consideration as Bio-diesel blends are more expensive than straight petroleum. Burlington, for example, reported that a 5% premium was incurred to secure a contractor willing to use bio-diesel in the same proportions as the City does.

Another challenge to the use of bio-diesel is supplier resistance. Both Hamilton and Toronto reported that their suppliers will only supply B5. Toronto's supplier has specified that the City must sign a waiver if it wishes to receive a blend with a higher bio-diesel content, protecting the firm in case the fuel damages the engines it is used in.

A final, related challenge to the use of bio-diesel is resistance by some manufacturers to honour the warranties on their engines if anything higher than B5 is used. One respondent noted optimistically that engine manufacturer Cummins recently certified its engines for the use of B20, however.

On the other hand, respondents noted approvingly that switching to bio-diesel does not require special infrastructure, quite unlike switching to propane or compressed natural gas.

Survey respondents reported no evidence of lower power and increased fuel consumption due to the use bio-diesel. In fact, the respondent from Markham reported that in his experience when a vehicle runs on bio-diesel it has *more* power. This, he speculates, is because bio-diesel is a solvent and cleans the engines it is used in. Jim McDowell, Manager of Equipment and Services for Halton, reported that the use of bio-diesel actually *improves* fuel efficiency.

In terms of bio-diesel's impacts on emissions, the response was almost universally positive. All but one respondent who offered an opinion on the subject said that bio-diesel was having a significant impact on their fleet's emissions. Halton reported having data that shows emissions are lower in vehicles burning bio-diesel than in similar vehicles burning regular diesel. The results of Peel's before and after monitoring of emissions from bio-diesel vehicles were more mixed: it found that with B5 all emissions decreased, but with B10 some increased while others decreased.

One final note on bio-diesel: while some respondents noted approvingly that bio-diesel (and ethanol) are renewable resources, others cautioned that the amount of energy that goes into growing and processing these fuels merits further study to identify the most energy efficient feedstocks and processes.

8.3 Ethanol

Six GTA-CAC municipalities or municipal agencies reported using ethanol in their fleets. However, only Richmond Hill and Toronto reported that the ethanol they use contains a higher bio-fuel content than the 5% mandated by the Province of Ontario. Richmond Hill has been using E10, a blend of gasoline (90%) and ethanol (10%) since 2004. Toronto, likewise, uses E10 year-round.

Opinion was split, on whether ethanol was having a significant impact on emissions from municipal fleets.

8.4 Compressed Natural Gas

Only Hamilton and Toronto reported that they are currently using Compressed Natural Gas (CNG) in vehicles. Toronto's fleet includes 138 natural gas-powered pick-up trucks. Hamilton reported that it is using CNG in 100 transit buses and that this has had a significant impact on emissions.

Hamilton also reported, however, that its CNG vehicles break down more frequently than diesel vehicles and that replacement parts are expensive. In fact, the respondent from Hamilton estimated that the maintenance costs of CNG vehicles are about 9 times those of diesel vehicles. While the respondent acknowledged that newer CNG vehicles are more reliable than older ones, he expressed a preference for hybrid vehicles instead because, unlike the use CNG vehicles, hybrids require no special infrastructure, and the emission reductions achieved are equal or greater.

Another consideration noted about CNG is that its availability varies from location to location, according to the policies of the local gas utility.

8.5 Propane

The respondent for Halton reported that propane was used to fuel police cars in the past, but that the practice was discontinued 8 to 10 years ago. Halton grappled with mechanical problems in the vehicles it fueled with propane because propane is a dry fuel, and the lack of lubrication led to piston malfunction. Fuel availability was also problematic.

9. Fuel Consumption Measurement and Reporting

Most GTA-CAC jurisdictions reported tracking fuel consumption by one method or another. Each of Mississauga's three fuelling stations, for example, has a computer that automatically gathers information identifying the vehicle, the amount of fuel taken, and the date of the transaction. Similarly, Toronto Fleet Service's computerized fuel system tracks the amount of fuel consumed by each vehicle and charges the fuel cost back to the user division. A number of other GTA-CAC jurisdictions use or are considering using a variety of fuel or fleet management software programs for this purpose; among them:

- Phoenix™ (OPW Fuel Management Systems) - Ajax & Clarington
- Profuel - Toronto
- RTA Fleet Management (Ron Turley Associates) - Pickering (under consideration)

- Winfuel® (Alternate Solutions Inc.) - Burlington, Hamilton, Oshawa & Richmond Hill

Opinion was split on whether the impacts on emissions of measuring and reporting on fuel consumption are significant. In fact, majority opinion was that the impacts are unknown, due in part to the fact that these are new initiatives in some jurisdictions (Hamilton and Oshawa, at least) and it is too early to tell how effective they are. In other jurisdictions, however, where these initiatives are not as new, the results do not seem to be very significant. In fact, the fleet manager for one municipality noted that, though they send monthly fuel consumption reports to every municipal department, there is no evidence that it has had any impact on fuel consumption.

One issue identified is that fleet managers often lack tools with which to hold individual municipal departments accountable for their actions. Where individual departments are not charged for the fuel they use, there is little motivation for those departments to curtail their use. However, where individual departments *are* charged for the fuel they use, as in Toronto, this may act as an incentive for management in these departments to address any evidence of misuse and waste.

Another issue identified by respondents is the degree to which the data collected is accurate. In Richmond Hill, for example, individual vehicle operators log mileage manually. The quality of the data they collect is directly related to the diligence they show in collecting it, which is difficult to control. The results can be wildly variable and misleading. Richmond Hill plans to tackle this issue by installing vehicle data units in 80 vehicles that will automatically transmit data to the operations centre regarding how long a vehicle has been operating, how long it has been idling, and how many kilometers it has traveled. This information, in turn, can be use to accurately track fuel consumption and fuel efficiency for individual vehicles.

Two other issues were identified, which may have a causal relationship:

1. One respondent noted that their Council has never asked for information about fuel consumption, so there was little motivation to gather or analyze it.
2. The same respondent noted that they didn't have enough staff resources to devote the time necessary to compile the data and analyze it.

9.1 E3 Fleet Rating System

The E3 Fleet Rating System is a made-in-Canada standard that recognizes performance in reducing emissions and fuel consumption while improving fleet performance and utilization.

In 2007, Hamilton became Canada's first Green Rated Fleet under the E3 Fleet Rating System. Between 2005 and 2006, Hamilton's fleet increased fuel efficiency by 5% and decreased GHG emissions by 2% for every kilometer traveled. The analysis provided as part of the rating process was the first opportunity Hamilton had to measure its performance.

Working with the Province of Ontario, E3 Fleet will be offering additional opportunities for GTA fleets to measure performance improvements in fuel use and emissions.

10. Aftermarket Products

Additives and devices that are used to improve fuel efficiency and reduce emissions, but that are *not* supplied by the original vehicle manufacturer, are referred to as aftermarket products. These can come in many forms, including pills made primarily of corn starch for insertion into fuel tanks, or adhesive "chips" to apply to the underside of fuel tanks.

Most GTA-CAC municipalities have been approached by the vendors of aftermarket products. In fact, the respondent for Mississauga said that her jurisdiction is "besieged" by such offers, amplifying comments made by respondents from other jurisdictions. A few municipalities have actually tested aftermarket products, with mixed results. While some continue to use them, others have developed or are developing policies for more efficiently and effectively dealing with their vendors.

10.1 Fuel Additives

Both Hamilton and Mississauga have tested fuel additives in their vehicles, although neither municipality is doing so currently. For one year, Hamilton tested a product which was about 98% kerosene. The product's marketers claimed the product would reduce fuel consumption by 20%. Hamilton found that it wasn't worth the expense.

Peel reported that is currently using two fuel additives:

1. BG 44K® Power Enhancer®, a concentrated fuel system cleaner which is purported to remove deposits from combustion chambers, intake manifolds, ports and valves, restore flow in fuel injectors, improve fuel economy and reduce exhaust emissions; and
2. Ford Cetane Booster, which is intended to reduce engine deposits and improve fuel economy.

No evidence was provided attesting to the effectiveness of either product.

10.2 Hydrogen Fuel Enhancement

When added to air-fuel mixtures in internal combustion engines, small amounts of hydrogen improve fuel efficiency and reduce exhaust emissions. Four GTA-CAC municipalities—Clarington, Halton, Hamilton and Oakville—reported that they have tested, are testing, or have plans to test hydrogen enhancement technologies in their vehicles.

Before its vehicles were absorbed into the Durham Transit fleet, Clarington installed Canadian Hydrogen Energy Company's "hydrogen fuel injection" system on its buses. Using 4 litres of distilled water per 10,000 kilometres to create the hydrogen, the injection system achieved a 10% reduction in fuel consumption while producing more torque and horsepower. The same technology, when tested by ETV Canada, more about which below, reduced fuel consumption by 4.44%, PM emissions by 7.0%, HC emissions by 6.17%, NOx emissions by 4.34%, and CO emissions by 0.39%.[15]

Oakville Transit is about to start a pilot project that will see Hy-Drive Technology's "hydrogen generating system" installed on three buses. The manufacturer claims that the use of its technology will reduce fuel consumption by a minimum of 8%, based on the experiences of users in the trucking industry, EMS fleets, and the mining sector. Oakville will gather baseline data from these three buses for two or three weeks. Thereafter, the technology will be installed and tested on these vehicles and performance data will be gathered for three months.

A challenge to Oakville's pilot arose when Cummins, the manufacturer of the engines on the buses to be used in the pilot, stated that any damage caused to an engine by the use of hydrogen would void its warranty. To overcome this, Hy-Drive agreed to assume the liability for any damage caused by its technology. Hy-Drive is also providing the hydrogen generating systems, each of which typically retails for USD$12,000, free-of-charge, and is paying half the costs ($1,500) associated with modifying one smaller bus so that it can actually accommodate the equipment.

Hamilton is also currently evaluating hydrogen enhancement technology on three vehicles.

Halton Region had planned to test hydrogen enhancement technology on one Emergency Medical Services vehicle, however the project has been put on hold indefinitely because Ford Motor Company, the manufacturer of the vehicle in question, stated that it would not honour engine warranty claims if hydrogen was used in its engines.

---

[15] ETV Canada, Hydrogen Fuel Injection System: Technology Fact Sheet for Canadian Hydrogen Energy Company Ltd., 2005 http://www.etvcanada.com/data/PDF_CHEC.pdf

10.3 The Tadger

Three GTA-CAC municipalities—Markham, Oshawa and Peel—reported that they are currently using or have used an aftermarket device called the Tadger, which is installed into input fuel lines to enhance combustion efficiency. The respondent for Oshawa speculated that these devices were having a significant impact on emissions in his jurisdiction, but offered no evidence of this. The respondent for Markham was less sure, but noted that his jurisdiction found a 2 to 5% improvement in the opacity test results of older vehicles when equipped with a Tadger. However, Markham found no significant difference in the test results among newer vehicles equipped with a Tadger. Peel reported that it tested Tadgers on its loaders for several months, but found they had no impact.

10.4 Dry Selective Catalyst™

Caledon and Vaughan reported that they have tested/are testing the Dry Selective Catalyst™ a product of Global Emissions Systems Inc. No verified data about the product's effectiveness was provided.

10.5 Municipal Policies and Procedures

GTA-CAC municipalities reported that they are approached frequently by vendors of aftermarket products which the vendors claim will improve fuel efficiency and reduce emissions, but for which there is little or no verified performance data. More than one respondent recounted cases where vendors had by-passed municipal staff altogether, and appealed directly to elected officials, which resulted in pressure on staff to test the product or at least to justify why they were not testing the product.

To deal with these pressures, Hamilton and Mississauga have adopted more or less formal policies on how to respond to the vendors of aftermarket products, and Markham is in the process of doing so. In 2005, Hamilton City Council accepted the following recommendation of the Public Works, Infrastructure and Environment Committee:

> "That the environmental benefits of any fuel-saving device or fuel additive be certified by ETV Canada …as a requirement before any offer to the City by prospective vendors of these products is considered."[16]

[16] Public Works, Infrastructure and Environment Committee, *Minutes 05-011*, City of Hamilton, 2005. Accessed from http://www.myhamilton.ca/NR/rdonlyres/512D7DD0-F38B-4412-B6A8-AEEC0F902F71/0/Jun20Minutes05011.pdf.

Similarly, in Mississauga, all fleet managers (corporate, transit and fire) have agreed on a consistent response: vendors of aftermarket products are now referred to the purchasing department or to ETV Canada. Toronto Fleet Services also refers vendors to ETV.

10.6 ETV Canada

ETV Canada is the independent verification organization which manages Canada's Environmental Technology Verification Program under a license agreement with Environment Canada. Verification of the performance claims of the manufacturers of engine and vehicle aftermarket technologies have been temporarily suspended while stakeholders—including verification labs and the Canadian Association of Municipal Fleet Managers—evaluate a protocol for testing and verifying the performance of these technologies. For more information about ETV Canada, and the status of the protocol, readers are encouraged to contact Steve Guerin, General Manager, ETV Canada, by phone at 905-822-4133 x 228 or by e-mail at sguerin@oceta.on.ca.

11. Emissions-related Language in RFPs, Contracts and Purchasing Policies

Several GTA-CAC municipalities and municipal agencies reported that they had experience incorporating emissions-related language in requests for proposals (RFPs), contracts and purchasing policies: Burlington, Caledon, Hamilton, Mississauga, Oshawa, Peel, Toronto, and the TTC.

The respondent for Burlington reported that his municipality tries to put emissions-related language into vehicle specifications, asking vendors to specify whether their vehicles are zero emission, ultra-low emission, or low emission. However, he noted, vendors rarely respond with anything other than fuel efficiency ratings for their vehicles, which is a related, but different indicator.

The language in the purchasing policies of Caledon, Hamilton and Mississauga is general in nature. The purchasing goals and objectives excerpted from the *Purchasing Policy for the City of Hamilton* and included below, illustrate this:

> "(3) Ensure the best value of an acquisition is obtained. This may include, but not be limited to, the determination of the total cost of performing the intended function over the lifetime of the task, acquisition cost, installation, disposal value, disposal cost, training cost, maintenance cost, quality of performance and environmental impact.
> (4) Further, the City of Hamilton's commitment to procure Goods and/or Services with due regard to the preservation of the natural environment

> and to encourage the use of "environmentally friendly" products and services, as supported by Vision 20/20 goals and strategies."[17]

Under Toronto's policy statement regarding environmentally responsible procurement, the municipality has committed, wherever possible, to amend specifications to provide for the expanded use of environmentally preferred products (EPPs). The policy statement, which is attached as Appendix C, defines EPPs as including products that "produce fewer polluting by-products and/or safety hazards during manufacture, use or disposal."

One other GTA-CAC municipality, Markham, reported that it is currently developing a green procurement plan.

12. Emission Reduction Credits

An emissions trading program has been in place in Ontario since 2001. Under the program, each individual facility in seven industrial sectors has annual allowances of emissions of nitrogen oxides (NO_x) and sulphur dioxide (SO_2). If a facility's emissions exceed its allowances in a given year, it must purchase unused allowances from other facilities, or Emission Reduction Credits (ERCs) from facilities outside the seven industrial sectors. Municipalities can create ERCs by undertaking strategies to reduce their emissions, and can bank, sell or trade their credits. Thus far, however, the market for ERCs is limited.

Recognizing that emissions trading may become more widespread in the future and ERCs more valuable, two GTA-CAC municipalities, Halton and Toronto, have policies to secure the rights to any/all ERCs associated with reducing emissions. The following clause was included in Halton's gasoline and diesel fuel tenders in 2003 and 2006, for example:

> "Emission Reduction Credits (ERCs)
> [Halton] is aware that there may be ERCs available as a result of the production, sale and purchase of "alternative fuels" under a contract(s) resulting from this tender. In the event that ERCs, specific to a [Halton] agency's purchase, are generated, the Supplier agrees to retire, not sell, the generated ERCs. This ensures that the air quality benefits are not reduced or eliminated."

[17] Corporate Services (Purchasing Section), *Purchasing Policy for the City of Hamilton,* City of Hamilton, 2007. Accessed from http://www.myhamilton.ca/NR/rdonlyres/62B2C1FF-8374-45F2-B19F-D3463DFBFC9F/0/PurchasingPoliciesApprovedMay162007.pdf

13. Other and Miscellaneous

Emission reduction strategies other than those discussed above were mentioned by a limited number of survey respondents, either in the surveys themselves, or during the course of follow-up interviews. Most notable among these were regular vehicle maintenance and modal shift, both of which are discussed briefly below.

13.1 Vehicle Maintenance

Two GTA-CAC municipalities, Halton and Markham, emphasized the importance of regular vehicle maintenance as a strategy to reduce emissions from their heavy duty and off-road fleets. The respondent for Markham, in particular, reported that his jurisdiction's vehicles receive regular tune-ups and oil changes, that his jurisdiction's drivers check their tire pressure every day, and that the emission profile of Markham's vehicles is impressive as a result.

13.2 Modal Shift

Two survey respondent suggested that if municipalities focused their efforts on shifting trips from private automobiles to other, less-polluting modes of transportation, such as transit, bicycles and walking, it would be a more effective strategy than focusing their efforts on reducing emissions from municipal vehicles alone. Considering that municipal vehicle trips are a small fraction of the total number of vehicle trips in any municipality, this is probably true.

To this end, several GTA-CAC municipalities support Transportation Demand Management initiatives (TDM) and/or employee trip reduction programs. More information about these may be obtained by contacting the Smart Commute Association, a partnership between municipalities in the Greater Toronto Area and Hamilton, to help employers and commuters explore commuting alternatives like carpooling, teleworking, transit, cycling, walking or flexible work hours.[18]

14. Conclusions and Recommendations

GTA-CAC municipalities have experience with a wide range strategies aimed at reducing emissions from the vehicles in their fleets. Some involve the use of new technologies, others are attempts to modify behaviour, and yet others are a combination of the two. In some instances, GTA-CAC municipalities have even taken a leadership role. Several use cleaner fuels than they are required to, for example, while others have tested and/or are testing new, unproven technologies in an effort to push the envelope.

[18] The Smart Commute Association website is at http://smartcommute.ca/home.

Still, while the experience of these municipalities is broad, in most cases it does not appear to be very deep. Aside from bio-diesel, which is now used in most jurisdictions and well-regarded, it appears that new emission-reducing technologies have been deployed in a limited number of vehicles in a few municipalities. Similarly, aside from anti-idling policies and by-laws, which are widespread, attempts at modifying behaviour to reduce emissions appear to have been few.

There are many reasons for the relative lack of depth in experience, the main one being that reducing emissions has only recently acquired a sense of urgency in the broader society. The lack of direction from senior management mentioned by some respondents is symptomatic of the newness of the issue, and the lack of financial and/or staff resources dedicated to the problem is its direct result. Put another way, awareness of the urgent need to reduce emissions is greater than the awareness of how best to do so.

As was abundantly clear from the research, data about the environmental and health impacts of the various emission reduction strategies *and* their economic costs and benefits is limited. Very few municipalities are able to quote the results of before-and-after studies of the effectiveness of the various emission reduction strategies. Without verified, defensible data about the impacts of these strategies, however, it will continue to be difficult to convince decision makers that investing in them is worthwhile.

To that end, it is recommended that the GTA-CAC support CAP in researching and communicating existing data that quantify the environmental and health impacts and economic costs and benefits of implementing emission reduction strategies. It is also recommended that GTA-CAC municipalities, together with CAP, seek funding for pilot projects to document the impacts on fuel consumption, emissions, health and budgets before and after the implementation of various emission reduction strategies.

By creating good data and reports on actual experience, this approach has the potential to accelerate the uptake of these strategies by GTA-CAC and other municipalities.

Green Fleet Plans

Several GTA-CAC municipalities have green fleet plans, which discuss a narrower range of emission reduction strategies in greater detail. Several of the these documents can be accessed on-line, including:

- Hamilton's *Green Fleet Implementation Plan* and *Green Fleet Implementation Plan Update*;[19]
- Markham's *Green Fleet Transition Plan*;[20]
- Mississauga's *City Fleet Emissions Reductions Study*[21]; and
- Toronto's *Green Fleet Transition Plan* .[22]

Toronto's green fleet plan for 2008-2011 will be released at the end of 2007.

[19] Both of which can be accessed from http://www.myhamilton.ca/myhamilton/CityandGovernment/CityDepartments/PublicWorks/FleetServices/Green+Fleet+Plan.htm.

[20] Which can be accessed from http://www.markham.ca/Markham/Departments/StratServ/EnvrLdshp/GreenFleet_Links.htm#transitionplan

[21] Which can accessed from http://www.mississauga.ca/file/COM/GreenFleetReport.pdf

[22] Which can be accessed from http://www.toronto.ca/fleet/green_fleet_transition.htm.

Contacts

Burlington: Fleur Storace-Hogan, Environmental Projects Support Officer – 905-335-7600 ext. 7580, or storace-hoganf@burlington.ca

Halton: Jim McDowell, Manager of Equipment and Services - 1-866-442-5866 x 7709, or jim.mcdowell@halton.ca

Halton: Garry Tate, Purchasing Analyst - 905-825-6000 x 7036, or Garry.Tate@halton.ca

Hamilton: Chris Hill, Manager Central Fleet - 905-546-2424 x 4593, or cghill@hamilton.ca

Markham: Laurie Canning, Fleet Manager - 905-475-9896, or lcanning@markham.ca

Mississauga: Brenda Sakauye, Environmental Coordinator - 905-615-3217, or brenda.sakauye@mississauga.ca

Oakville: Barry Cole, Director, Transit Services - (905) 845-6601 x 3507 , or bcole@oakville.ca

Oshawa: Tim McKeown, Acting Fleet Manager - 905-433-1221 x 2153, or tmckeown@oshawa.ca

Peel: Lynne Germaine, Manager, Operations Support - 905-791-7800 x 3287, or lynne.germaine@peelregion.ca

Pickering: Grant Smith, Supervisor, Fleet Operations - 905-420-4660 x 5244, or gsmith@city.pickering.on.ca

Richmond Hill: Rodney Young, Fleet Supervisor - 905-884-8013 x 4419, or ryoung@richmondhill.ca

Toronto: Sarah Gingrich, Business Development and Improvement Analyst, Fleet Services - 416-392-4397, or sgingri@toronto.ca

Whitby: Alana Fulford, Planner - 905-430-4306 ext. 2332, or fulforda@whitby.ca

APPENDIX A: Vehicle and Equipment Idling Policy – Peel

Pathways@Peel

Policy W00-08 - Vehicle and equipment idling policy

Printed on: April 25, 2007 at 10:37am

http://pathways.peelregion.ca/corpinfo/policies/Works/W00-08.shtm

Region of Peel
Working for you

Corporate Policy Manual

Policy No: W00-08
Effective Date: 2003-10-23

TAB:	**PUBLIC WORKS**
SECTION:	**GENERAL**
SUBJECT:	**VEHICLE AND EQUIPMENT IDLING POLICY**

PURPOSE

This document outlines the policy of a one minute idle time to: reduce the air pollution from vehicle and equipment exhausts, create a healthier environment, promote energy (fossil fuel) conservation, reduce noise pollution and reduce wear and service needs on Regional vehicles and equipment.

GENERAL

Vehicles and equipment idling have a significant impact upon the environment. The main areas of environmental impact are air quality and fuel consumption. Air quality is affected by the creation of smog (ozone in the lower levels of the atmosphere and production of carbon monoxide and other air borne pollutants). The affects on humans (and animals) may include respiratory problems ranging from not being able to handle extended outdoor activities to asthma and related disorders.

Idling Facts and Statistics:

1. An idling vehicle emits nearly 20 times more air pollution than when travelling at 50 km/hr.

2. Ontario Ministry of Transportation estimates that an idling gasoline vehicle with an average sized engine uses about 2.2 litres of fuel per hour and that an idling diesel truck engine uses about 3 litres of fuel per hour. Reducing idling time by 10 minutes a day translates into approximately 60.8 hours a year in fuel savings of more than 100L.

3. Turning off and starting an engine uses LESS fuel than letting the engine run for 30 seconds.

4. Modern vehicles need a maximum of 30 seconds of idle at start up. The best way to warm up a vehicle is by driving it.

5. Engine wear is greater at prolonged idle than during normal operation.

6. Although some fuels pollute less than others, they all contribute to air pollution and are therefore equally affected by this policy.

SCOPE

This policy applies to all employees who are authorized to operate a vehicle/equipment owned, leased or rented by the Region of Peel. Regulatory Affairs, Public Works will ensure that this policy is kept up-to-date.

EXEMPTIONS:

a) For vehicle/equipment maintenance and diagnostic purposes;

b) Under extreme weather conditions or any other time when the health and safety of employees or others may be jeopardized;

c) If the unit is not expected to restart due to mechanical problems (to be repaired ASAP);

d) Assisting on an emergency scene; and

e) When the engine is required to power auxiliary equipment (i.e.: hoist, lift, computers, safety lighting, and internal equipment).

POLICY

1. The driver/operator shall:

- not idle the vehicle/equipment while completing a circle check (unless required for air brake pressure or other critical checks necessary);
- not leave the vehicle/equipment unattended while idling;
- shut down the vehicle/equipment when it is expected to exceed the one minute idle time;
- ensure that vehicle/equipment deficiencies are reported immediately to the immediate supervisor or if it is unsafe to turn the unit off;
- idle the vehicle/equipment only if the motor is required to power auxiliary equipment;
- idle the vehicle/equipment only under extreme weather conditions; and
- idle the vehicle/equipment only when the health and safety of employees or others may be jeopardized.

2. The supervisor shall:

- make sure that employees are made aware of this policy; and
- ensure that all employees adhere to this policy

3. Fleet Services shall:

- idle vehicles/equipment only when necessary for maintenance and diagnostic purposes; and
- ensure that idling be kept to a minimum.

PROCEDURES

1. The driver/operator will:

a) check the vehicle/equipment prior to leaving to ensure that safe turn off of the unit can be accomplished;

b) report the defect in the Vehicle Inspection Log Book and provide to the immediate supervisor to determine if it is safe to be operated or needs to be repaired immediately if the unit can not be turned off;

c) turn off and remove the keys from the ignition when the vehicle/equipment is left unattended;

d) turn off the vehicle/equipment, unless the vehicle/equipment motor is to be used for auxiliary power; and

e) turn off the vehicle/equipment when it is expected to exceed the one minute idle time, and it is safe to do so.

2. The supervisor will:

a) Fill out the Vehicle Repair/Service Request (V-12-041), when the vehicle/equipment is reported to be unsafe to turn off;

b) Determine if vehicle/equipment is to be operated or put in for immediate repair;

c) Put in a request to Fleet Services and with copy of Vehicle Inspection Log sheet;

d) Instruct employees of this policy; and

e) Ensure that all employees adhere to this policy.

POLICY CONSEQUENCES

a) Non-compliance with this policy by the driver/operator may result in disciplinary action; and

b) The supervisor shall ensure that all employees adhere to this policy and deals promptly with all non-compliance issues.

SOURCE: CAO Directive C04-05
LAST REVIEW: October, 2003
LAST UPDATE: October, 2003

APPENDIX B: Idle Free Policy – Toronto

Fleet Services Policy
Idle-Free Policy
Category: **Working Environment**

Policy Statement

This policy will reduce unnecessary idling of City of Toronto vehicles and equipment, to reduce the amount of carbon dioxide and smog pollutants being released into the atmosphere.

Application

This policy applies to all City employees who operate City of Toronto vehicles.

Definitions

Idling –
Parking a vehicle and keeping it running while it is not operational or performing a job function.

10 second rule –
If you're stopped for more than 10 seconds, turn off your vehicle. Ten seconds of idling uses the same amount of fuel as stopping and starting your vehicle.

Warm-up time –
The time needed for a vehicle to be at an operational temperature.

Carbon dioxide –
Carbon dioxide (CO_2) is a "greenhouse gas" which is causing global climate change. Vehicle emissions are the largest source of greenhouse gases in Toronto.

Smog pollutants –
Vehicles emit a mixture of pollutants that contribute to smog formation, poor air quality and health problems such as asthma symptoms and breathing problems.

Responsibilities

Divisions will:

- Ensure their staff are aware of the policy
- Educate and inform drivers when they are spotted idling in non-operational situations
- Post information relating to the Idle-Free policy in all workplaces

Those with supervisory responsibilities will:

- Work with Fleet Services to ensure their staff are educated and aware of the policy and what is expected of them
- Alert drivers that do not conform to the Idle-Free policy
- Abide by the 10 second rule: if stopped in a non-operational situation for more than 10 seconds, turn the vehicle off

Workers/drivers/operators will:

- Abide by the 10 second rule: if stopped for more than 10 seconds in a non-operational setting, turn the vehicle off

- Follow these warm-up times for vehicles:

  Heavy duty vehicles and equipment:

- Above 0 degrees Celsius (°C)	3 to 5 minutes
- Below 0°C	3 to 5 minutes

  Light duty vehicles (cars, vans, light trucks and sport utility vehicles):

	Gasoline Engines	Diesel Engines
- Above 0°C	10 seconds	10 to 30 seconds
- Below 0°C	10 to 30 seconds	30 to 60 seconds

- Use recommended shut-down idle time of diesel engines: 10 to 30 seconds
- Ensure that oil pressure and air pressure are within the normal operating ranges, and all windows are clear of ice and snow before operating the vehicle or equipment
- After a short warm up period, and for the first few minutes of use, operate the engine at a gentle throttle until the normal operating temperature is reached

Fleet Services will:

- Create an Idle-Free education program for all City drivers and make it available to all interested parties
- Investigate and invest in technologies that limit vehicle idling, where appropriate

Workers/drivers/operators who do not follow these guidelines are subject to the disciplinary process.

Exemption

Emergency vehicles from Toronto Fire, Toronto Police, Emergency Medical Services (EMS), and Toronto Transit Commission (TTC) buses as outlined in Toronto's Idling Control By-law.

Approved by

Senior Management Team

Date Approved

April 23, 2007

Related Information

Idling Control By-law

APPENDIX C: Policy re Environmentally Responsible Procurement– Toronto

PURPOSE

To increase the development, awareness and purchase of environmentally preferred products (EPP) and services.

POLICY

In order to increase the development and awareness of environmentally sound purchasing, acquisitions of goods and services will ensure that wherever possible specifications are amended to provide for the expanded use of EPP such as: durable products, reusable products, energy efficient products, low pollution products, products (including those used in services) that contain the maximum level of post-consumer waste and/or recyclable content, and products that provide minimal impact to the environment.

An EPP is one that is less harmful to the environment than the next best alternative having characteristics including, but not limited to the following:

(1) Reduce waste and make efficient use of resources: an EPP would be a product that is more energy, fuel, or water efficient, or that uses less paper, ink, or other resources. For example, energy efficient lighting, and photocopiers capable of double-sided photocopying.

(2) Are reusable or contain reusable parts: these are products such as rechargeable batteries, reusable building partitions, and laser printers with refillable toner cartridges.

(3) Are recyclable: a product will be considered to be an EPP if local facilities exist capable of recycling the product at the end of its useful life.

(4) Contain recycled materials: an EPP contains post-consumer recycled content. An example is paper products made from recycled post-consumer fibre.

(5) Produce fewer polluting by-products and/or safety hazards during manufacture, use of disposal: an EPP product would be a non-hazardous product that replaces a hazardous product.

(6) Have a long service-life and/or can be economically and effectively repaired or upgraded.

It is recognized that cost analysis is required in order to ensure that the products are made available at competitive prices, and that the environmental benefits provided by a product or service does not undermine its overall performance.

Given the environmental and economic importance of infrastructure, environmentally responsible procurement principles should be applied to construction design, processes, tendering and materials; and given that many environmentally preferred products and services can produce a variety of tangible benefits, full consideration should be given to the long-term and complete costs and benefits of environmentally responsible procurement.

Adopted by Council at their meeting of October 26 & 27, 1999, Report 6, clause 3 of the Administration Committee

PROCEDURE

1. Bidders/Proponents are made aware of the Environmentally Responsible Procurement Policy in all Request for Quotations, Request for Proposals, and Tenders Calls issued by the Purchasing and Materials Management Division.

2. The Policy is applied in the evaluation of all quotations, proposals and tenders received in determining the successful bidders/proponent.

CONTACT

Should you have any questions, please contact the Purchasing and Materials Management Division. In the event that further interpretation is required, please contact the Manager, Corporate Purchasing Policy & Quality Assurance at 416-392-0387 or Supervisor, Policy, Training & Technology at 416-392-1305.