BACKGROUNDER

Fuelling Clean Air: Municipal Fuel Purchasing Policies that Reduce Emissions Contributing to Poor Air Quality & Climate Change

Introduction

- While air quality is affected by a large number of air pollutants interacting synergistically, there are several common air pollutants that have been clearly and consistently linked to negative human health impacts:
  - ground-level ozone and its precursors, volatile organic compounds (VOCs) and nitrogen oxides (NOx)
  - fine particulate matter (PM) & sulphates (SO_4)
  - carbon monoxide (CO), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2)

- Low sulphur fuels can improve air quality in two distinct ways:
  - By reducing vehicle emissions of SO_2, SO_4 and PM; and
  - By increasing the effectiveness of existing emission control devices and enabling the use of more advanced emission control devices.

- Alternative fuels and vehicle retrofits can produce climate change benefits by reducing net emissions of carbon dioxide (CO_2).

Municipal Fuel Purchasing Policies – Case Studies

City of Toronto

- Since 1999, the City has had a fuel purchasing practice designed to favour gasoline and diesel that contain lower levels of sulphur.
- It includes purchasing on-road diesel for the City's off-road fleet of vehicles;
- It has reduced SO_2 emissions from the City's corporate fleet from about 29.5 tonnes per year to about 6 tonnes per year;
- It has cost the City about 1% more each year than it would have to buy the cheapest fuel.

Region of Waterloo

In 2003, the Region will be:
- Purchasing on-road diesel for the Region's off-road diesel fleet;
- Purchasing ultra low sulphur diesel (ULSD) for the Region's buses;
- Retrofitting 60% of the Region's buses with catalytic exhaust mufflers (CEM);
- Using E10 (10% ethanol/90% gasoline) for the Region's gasoline-fuelled fleet.

City of Brampton

The City:
- Began purchasing B20 (20% biodiesel/80% conventional on-road diesel) for the City's Corporate on- and off-road diesel fleets in 2002;
- Plans to use B20 in the City's buses in the future; and
- Plans to use B100 (100% biodiesel) in the City's Corporate on-road and off-road diesel fleets during the summer months in the future;
- Began using E10 in the City's gasoline-fuelled fleet in 2002.

Lowering Emissions from Off-Road Diesel Vehicles

- Off-road diesel vehicles can include back loaders, large lawn mowers, sidewalk clearers, back-hoes and ferries.
- Off-road emissions can be reduced by about 85% by using on-road diesel, that contained between 278 and 440 ppm sulphur in 2001, instead of off-road diesel, that contained between 1300 and 3700 ppm sulphur in 2001.
- In Toronto, this practice reduced SO_2 emissions by about 10 tonnes/year while in Waterloo Region, it will cut emissions of sulphur oxides (SOx) by about 8.5 tonnes/year.
- In the three years that Toronto has purchased on-road diesel for its off-road fleet, it has paid between 2.7% less and 5.7% more per litre than for the cheapest off-road diesel.

Lowering Emissions from On-Road Diesel Vehicles

Emissions from on-road diesel fleets can be reduced in several ways:

Selecting Conventional Diesel with the Lowest Sulphur Levels

- Given that sulphur levels in on-road diesel in Ontario ranged from 278 to 437 ppm in 2001, SOx emissions can be substantially reduced by simply favouring the supplier with the lowest sulphur levels.

- In 2003, the City of Toronto will reduce SO_2 emissions from its on-road diesel fleet by about 1.5 tonnes with this practice.

Retrofitting Buses with Catalytic Exhaust Mufflers (CEM)

- CEMs are mufflers equipped with oxidation catalysts.
- The U.S. EPA has estimated that oxidation catalysts can reduce emissions of PM, CO, and HC by about 40 to 50% and emissions of NOx by about 2.8 to 4.4% when installed on heavy-duty 4-stroke diesel engines
- Demonstration studies suggest that when older buses are retrofit with CEMs, emissions of PM, CO and NOx can be reduced by up to 34%, 74% and 3.8% respectively for a cost of about $3,200 to $5,000 per bus.

Rebuilding Buses with Electronic Engine Controls

- Estimates suggest that when the engines in older buses are rebuilt with electronic engine controls and retrofitted with CEMs, emissions of PM, CO and NOx can be reduced by up to 92%, 74% and 33% respectively, for a cost of $20,000 to $50,000 per bus.
- These actions can also reduce fuel costs and carbon dioxide (CO_2) emissions by about 8% by increasing the vehicle's fuel efficiency.

Using ULSD in Buses and/or the Corporate fleet

- Ultra Low Sulphur Diesel (ULSD) is diesel that contains15 ppm
- When ULSD is used instead of conventional on-road diesel, SOx emissions can be reduced by about 95%.
- When ULSD is used in vehicles equipped with oxidation catalysts, emissions of CO, PM, SO_4 and polycyclic aromatic hydrocarbons (PAHs) can be reduced by an additional 35%, 15%, 92% and 15% respectively.
- ULSD is also essential with the use of more advanced emission control technologies such as continuously regenerating diesel particulate filters which can produce significant reductions in a broad array of air pollutants.
- In 2003, ULSD will cost the Region of Waterloo about 6 to 7% more per litre than conventional on-road diesel.

Using Biodiesel in Buses and/or in the Corporate Fleet

- Biodiesel fuels can be derived from plant or animal sources.
- Life-cycle analysis indicate that the production of B20 (20% biodiesel/80% conventional diesel) can reduce CO_2 emissions by 15.7% relative to the production of conventional diesel.
- The U.S. EPA estimates that B20's use in heavy-duty on-road diesel vehicles can reduce emissions of CO and PM by about 11% and 10% respectively, while increasing NOx emissions by about 2%.

- These impacts vary depending upon the model year of the engine, the source of the biodiesel (eg. plant or animal based), and the properties of the conventional diesel with which the biodiesel has been blended.
- B20 is also expected to reduce SO_2 emissions by up to 20%.
- In 2002, B20 was costing the City of Brampton about 6 to 7% more per litre than conventional diesel, while in 2003, it may cost up to 20% more per litre.

Lowering Emissions from Gasoline Fuelled Vehicles

Favouring Low Sulphur Gasoline

- Environment Canada expects sulphur levels for gasoline to be lowered to 30 ppm in a number of refineries in Ontario by the fall of 2003.
- By purchasing gasoline that contains 30 ppm sulphur many municipalities could reduce SO_2 emissions from their gasoline fuelled fleets by about 92% relative to 2001.

Selecting Ethanol Blends

- Ethanol is an alcohol fuel most commonly blended with gasoline to form an E10 blend (10% ethanol/90% gasoline).
- Life-cycle analyses suggest that the production of E10 can reduce CO_2 emissions by 3 to 4% relative to the production of gasoline.
- While in the U.S. it has been reported that E10 can reduce emissions of CO by about 25%, Environment Canada cautions that these reductions may not be realized with Canadian gasoline which has different properties.
- While E10 does appear to reduce emissions of SOx and the air toxic benzene, it also increases emissions of the air toxic, acetaldehyde.
- Currently, E10 can be purchased at the same price as conventional gasoline because of tax breaks.

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To download a copy of the report: www.opha.on.ca/resources/fuel.pdf
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