



LOW SULPHUR DIESEL AND TRANSIT BUS RETROFITS

Lessons Learned by the Region of Waterloo

In 2002, the Region of Waterloo Public Health Department prepared a report entitled “Discussion Paper for Clean Air Plan.” The report assessed the emissions impacts and costs of various policy options that could be adopted by the Region to reduce emissions associated with its corporate operations. Out of this process came three decisions:

- 1) diesel that contains a maximum of 15 parts per million (ppm)¹ sulphur would be purchased for the buses operated by the Region’s transit authority;
- 2) the Region’s older buses would be retrofitted with diesel oxidation catalysts; and
- 3) the Region’s transit authority would purchase 30 new 2003 model year buses equipped with diesel oxidation catalysts, and 18 new 2004 model year buses equipped with diesel particulate filters.

This fact sheet provides an account of steps taken by the Region of Waterloo to implement these decisions. Based on the Region of Waterloo experience, sample contract language is provided.

1) Region Requests Diesel with 15 ppm Sulphur

Conventional diesel in Ontario contains, on average, about 350 ppm sulphur.² Through the Region of Waterloo’s Clean Air Plan process, it was determined that the use of diesel fuel that contains a maximum of 15 ppm sulphur could:

- substantially reduce sulphur oxide (SO_x) emissions from the Region’s transit fleet;
- increase the effectiveness of emission control devices, such as diesel oxidation catalysts; and
- enable the use of more advanced emission control devices, such as diesel particulate filters.

In May 2003, the Region put out an Request for Proposal (RFP) requesting diesel fuel with a maximum of 15 ppm sulphur for its entire transit fleet. In response, one oil company indicated their willingness to supply diesel containing a maximum of 30 ppm sulphur.

1 Sulphur levels can also be reported as milligrams per kilogram (e.g., 30 ppm is equivalent to 30 mg/kg).
 2 Sulphur in Liquid Fuels 2002 (Environment Canada).



RFP Instructions, Terms & Conditions

The Region of Waterloo included definitions of “alternative fuels” and “15 ppm sulphur diesel” under the RFP “Instructions, Terms & Conditions” to ensure that suppliers understood that the fuel specifications provided by the Canadian General Standards Board (CGSB) and the American Society for Testing and Materials (ASTM) would apply to these fuels as well as to conventional fuels.

The following is a generic template based on the Region of Waterloo RFP language:

- Alternative fuels are defined as products such as (for example) E10 gasoline (10% ethanol, 90% gasoline), B20 biodiesel (20% biodiesel blended with 80% conventional diesel fuel), XX ppm sulphur gasoline, and XX ppm sulphur diesel fuel (as appropriate to each Bidder) that are readily available on the marketplace, as governed by all current (or subsequent amendments to) CGSB and *Canadian Environmental Protection Act, 1999* (CEPA 1999) regulations and specifications.
- Low-sulphur fuel is defined as gasoline or diesel fuel, currently available on the market, containing XX ppm or less sulphur content, which complies with all current CEPA 1999, CGSB, and ASTM standards and specifications or amendments thereof.

Split Awards

In order to accommodate suppliers that could not bid on alternative fuels and to avoid “exclusivity” issues within a public bid process, a provision was made to allow all bid responses by creating Part B (regular fuel) and Part C (alternative fuel and low-sulphur fuel) price sheets:

“The Worksheets/Price Sheets are in two (2) sections, Part B and Part C. Bidders may complete Part B, ‘Regular Fuel,’ and/or Part C, ‘Alternative Fuel,’ according to the definitions provided and the product lines marketed by them, in order to be considered.”

This process necessitated the potential award of two separate contracts (split awards) from one RFP, something that was permitted under the Region’s purchasing bylaws:

“All Bidders should be aware that the participating Agencies have agreed that more than one award may be made to several suppliers, in order to meet the requirements of the individual, participating Agencies. The Contract will be awarded on the basis of the submissions that best meet the needs of the participating Agencies for regular and alternative fuels. In this regard, the decision of the Cooperative is final.”

Lubricity Concerns with Diesel Containing Less than 50 ppm Sulphur

When the Region’s RFP was developed, there were few CGSB or ASTM specifications provided explicitly for diesel fuels containing less than 50 ppm sulphur. Among the specifications not yet established were those for lubricity. This was a concern for the Region’s transit authority, Grand River Transit, because reduced lubricity can produce maintenance problems. The Region requested that each party responding to the RFP include specifications for all products on which they were bidding. Potential suppliers of 15 ppm sulphur diesel fuel were asked to indicate how they intended to meet the minimum requirements of the Original Engine Manufacturers (OEM). The supplier that offered to provide 30 ppm sulphur diesel fuel indicated that:

“We have experience with the amount of additive that is required to meet satisfactory performance in the pump rig test and we are proposing a level (140 ppm additive) that is known to give satisfactory performance, even in the most severe fuels. We are confident that this level will be safe for use, with a significant margin of safety.”³

The supplier’s recommended specification for lubricity was accepted by the Region. The Region’s bus engines are being monitored for premature wear during regular preventive maintenance.



Affidavit of Compliance

While the Region included fuel definitions within its general instructions that made specific reference to CGSB and ASTM standards where applicable (Part A), it also required all bidders to sign an “Affidavit of Compliance” under Part F of the RFP. The following is generic language based on the Region of Waterloo requirement:

“By signing the Affidavit of Compliance (Part F), the Bidder acknowledges compliance with all appropriate CGSB, CEPA 1999, and/or ASTM standards and specifications, or revisions of same, for alternative fuels, such as (for example) XX ppm sulphur gasoline, E10 gasoline, B20 biodiesel, and XX ppm sulphur diesel, as applicable. The Bidder must also include (separate) a specification sheet(s) for each of the products being offered by the Bidder, including the current level of sulphur content in the Bidder’s alternative fuel(s), as expressed in parts per million (ppm), and, where appropriate, the octane and ethanol levels of each alternative fuel.”

This requirement was designed to ensure that the products received throughout the duration of the contract would meet any new fuel standards and/or specifications that had been introduced by the federal government, CGSB, or ASTM.

Fuel Price Comparison

Including all applicable taxes, the Region pays a premium of between \$0.05 and \$0.06 per litre for the 30 ppm sulphur diesel fuel. Regional Council felt this was acceptable given the emission reduction advantages associated with the use of this fuel.

2) Purchasing Diesel Oxidation Catalysts

The Region of Waterloo decided to retrofit 86 of its older transit buses (i.e., model years 1989 to 1999) with diesel oxidation catalysts over two years at a cost of \$360,000 (i.e., average cost of \$3,500 to \$5,000 per bus). Diesel oxidation catalysts are emission control devices that can substantially reduce emissions of carbon monoxide, total hydrocarbons, and particulate matter from the tailpipe. While diesel oxidation catalysts can reduce these toxic air pollutants in the presence of sulphur emissions, their effectiveness is increased significantly when they are used with diesel fuel containing very low levels of sulphur.



The diesel oxidation catalysts were purchased in a stand-alone tender process. The tender indicated that the Region wanted to purchase 43 diesel oxidation catalysts per year over a two-year period, for a total of 86. The tender did not provide the specifications for each of the diesel oxidation catalysts, pipes, and clamps that would be required to retrofit the 86 buses. Instead, it indicated that:

- mufflers must be the “bolt-on” type;
- installation would be done by Grand River Transit;
- Bidders should state what metals are used in the construction of the diesel oxidation catalysts, pipes, and clamps;
- Bidders should state what warranty would be provided; and
- Bidders should state what aftermarket support would be provided.

The Region also attached a detailed list to the tender, which stated the model year, make, and engine manufacturer for each of the 86 buses, so that bidders could determine what diesel oxidation catalysts, pipes, and clamps would be required to satisfy the Region’s needs.

3) Purchasing Diesel Particulate Filters

The Region of Waterloo has purchased 30 new buses for 2003 equipped with diesel oxidation catalysts, and it has purchased 18 new buses for 2004 equipped with continuously regenerating diesel particulate filters. The diesel particulate filters will cost about \$10,000 to \$12,000 per bus. When purchasing diesel oxidation catalysts or diesel particulate filters for new buses, the Region includes the equipment among the tender specifications for the new buses.

For more information

Ontario Public Health Association (OPHA)
Air Quality Project
<http://www.opha.on.ca/projects/air.html>

For additional information

Oil, Gas and Energy Branch
Environment Canada
351 St. Joseph Blvd.
Gatineau, QC K1A 0H3
or visit Environment Canada at
http://www.ec.gc.ca/energ/main_e.htm and
click on **Library/Reports**

Prepared with assistance from Rob Bromley, Public Health Department, Region of Waterloo.

The internet Web site addresses in this fact sheet were current at the time of printing and are subject to change.

Additional information can be obtained at Environment Canada’s Web site at www.ec.gc.ca or at the Inquiry Centre at **1-800-668-6767**.

