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Benzene in Canadian Gasoline: Report on the Effect of the Benzene in Gasoline Regulations

2004

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Benzene in Canadian Gasoline

2004

Notice

The information contained in this report is compiled from data submitted by the producers and importers of gasoline in Canada pursuant to the requirements of the *Benzene in Gasoline Regulations* under the *Canadian Environmental Protection Act, 1999*. Submissions have been verified for reasonableness but are subject to potential errors made at the source.

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1.0 Summary

This report reviews how primary suppliers have responded to the *Benzene in Gasoline Regulations* of the *Canadian Environmental Protection Act* and summarizes the information on composition of gasoline reported under the regulations for 2004. All of the information summarized in this report was provided to Environment Canada by producers, importers and blenders of gasoline, pursuant to the requirements of the regulations.

The *Benzene in Gasoline Regulations* came into effect on July 1, 1999, fulfilling a recommendation of the federal-provincial Task Force on Cleaner Vehicles and Fuels. In 1995, the Task Force recommended to the Canadian Council of Ministers of the Environment (CCME) that benzene in gasoline be reduced through a federal regulation to 1% by volume and that aromatics (or equivalent benzene tailpipe emissions) be frozen at 1994 levels. The CCME endorsed this recommendation. Consequently, the federal government passed the federal *Benzene in Gasoline Regulations* on November 26, 1997.

The regulations have been successful in achieving both of the recommendations of the Task Force: reported benzene levels have been significantly reduced and reported aromatic levels are about the same as they were in 1994. Figures 1.1 and 1.2 show how benzene and aromatics levels have changed since the coming into force of the regulations. Figure 1.3 shows that average urban ambient benzene concentrations, measured at Environment Canada monitoring stations across Canada, have fallen by 63% between 1991 and 2004. Since 1998, the year prior to the regulation coming into effect, average urban ambient benzene concentrations have fallen by almost 42% and rural ambient benzene concentrations have fallen by 60%. In addition, the reported level of MTBE in Canadian gasoline has fallen 57% and use of ethanol has increased 46% since 2000.

As of 2003, primary suppliers are required to submit reports annually under the Regulations, rather than quarterly as previously required. Primary suppliers reported that all gasoline supplied in Canada in 2003 met the regulated requirements with respect to benzene concentration and BEN levels.

Independent audits are required for those primary suppliers that elected to be on a yearly pool average and must be submitted to Environment Canada by May 31 of the year following the reporting period. This report includes analysis of the independent audits conducted for the 2003 and 2004 reporting periods. Those audits found forty-three instances of non-compliance with administrative requirements including laboratory procedures for the regulations. Most primary suppliers outlined corrective action to address these issues. Environment Canada views the audits as a crucial component of the enforcement provisions of the regulations.

Figure 1.1: Average Benzene Content of Canadian Gasoline 1994-2004

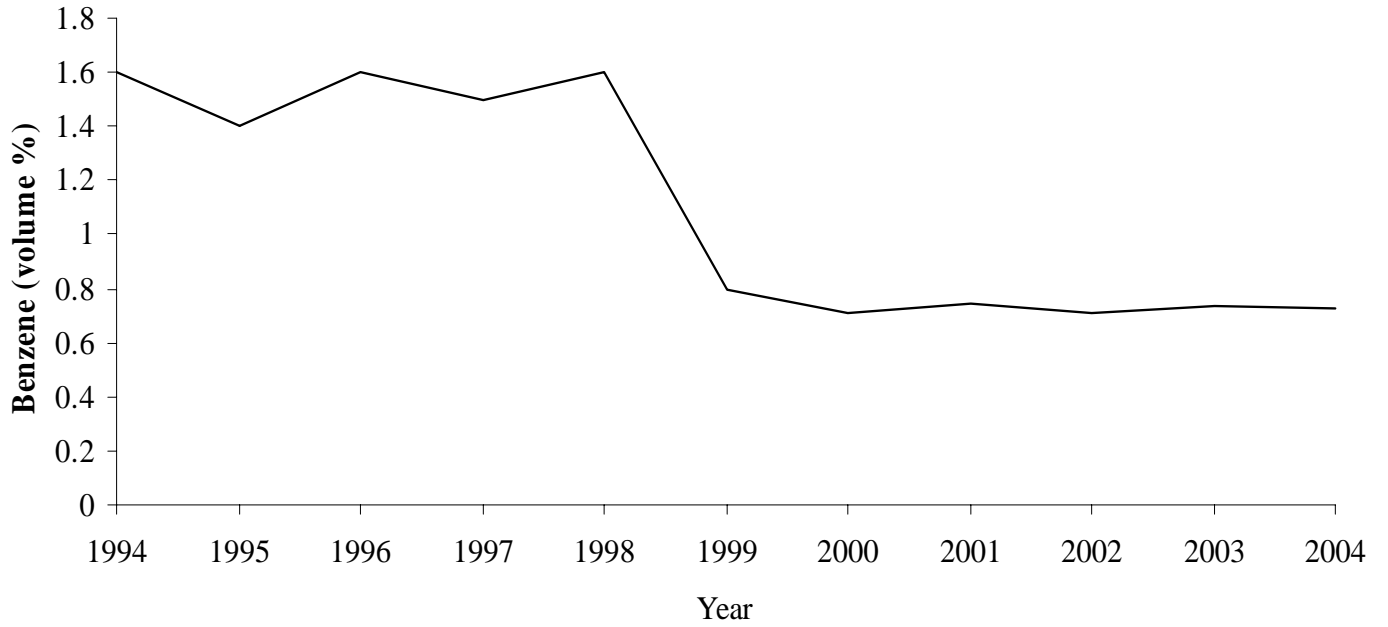


Figure 1.2: Average Aromatics Content of Canadian Gasoline 1994-2004

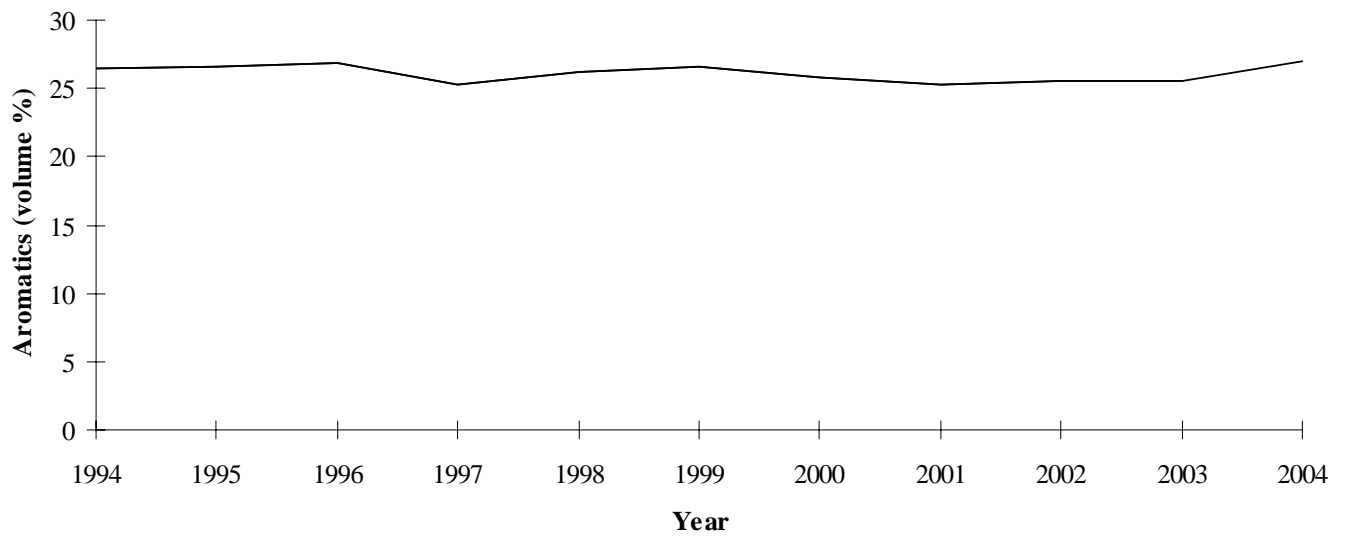
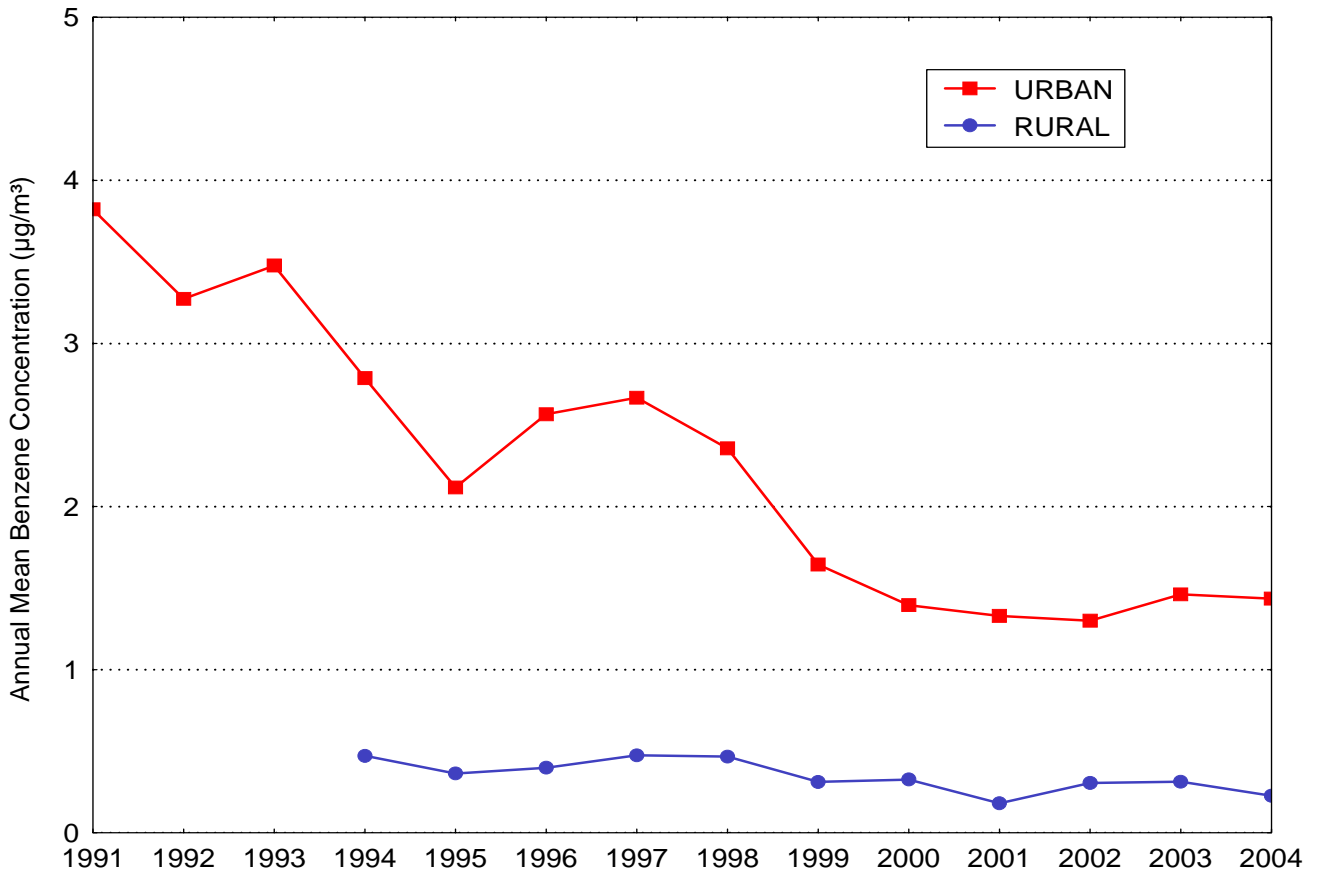


Figure 1.3: Average Ambient Benzene Concentration in Canada 1990-2004



Source: Tom Dann (Environment Canada), personal communication, 2004

2.0 Introduction

This report reviews the compliance of primary suppliers' (refiners, importers and blenders) gasoline with the *Benzene in Gasoline Regulations*¹ of the *Canadian Environmental Protection Act, 1999*, and summarizes levels of various parameters in Canadian gasoline for 2004. The information used for this report was provided by primary suppliers, as required under the regulations.

2.1 Benzene in Gasoline Regulations

The *Benzene in Gasoline Regulations* were passed in November 1997 in order to reduce emissions of benzene from gasoline-powered vehicles. The regulations limit the level of benzene and the benzene emission number (BEN)² of Canadian gasoline and require reporting on the composition of gasoline that is produced, imported or blended³. The regulations apply to all types of gasoline for sale or use in Canada, except gasoline for use in aircraft, competition vehicles or scientific research.

The *Benzene in Gasoline Regulations* introduced a new approach to controlling fuel composition by allowing regulatees the option to elect to use a yearly pool average as the basis for compliance. This option provides regulatees considerable flexibility in meeting the requirements of the regulations. The regulations are chiefly focused on primary suppliers (refiners, blenders and importers) who can affect the composition of gasoline. There is also a per-litre limit for benzene at the point of sale. In addition to setting a limit for gasoline benzene content, the regulations also set a limit for the benzene emission number (BEN) of gasoline, a number that relates gasoline composition to estimated emissions of benzene from vehicles.

The regulated limits apply to individual refineries, blending facilities, and imports into a province from outside Canada. Primary suppliers are subject to flat limits for each of their refineries, blending facilities or import pools unless they have elected for yearly pool average limits. The yearly pool average is the volume-weighted average of benzene or BEN of the gasoline supplied by the primary supplier during a year and may be selected for either benzene, BEN, or both. Independent audits must be submitted to Environment Canada by primary suppliers that elect to be on a yearly pool average.

Since July 1, 1999, primary suppliers have been subject to limits on the level of benzene and the BEN in the gasoline they produce, blend or import. Table 2.1 summarizes the regulated limits for benzene and the BEN.

¹ SOR/97-493, as amended by SOR/99-204, SOR/2000-102 and SOR/2003-318; a copy of the regulations can be found at www.ec.gc.ca/CEPARRegistry/regulations

² BEN - The Benzene Emission Number relates gasoline composition to the estimated emissions of benzene from vehicles. It is a number calculated using various gasoline parameters and relates gasoline composition to emissions of benzene from a "typical" 1990 vehicle. (see Schedule 1 of the Regulations)

³ The definition of "blend" in the regulations excludes the mixing of complying gasoline or the adding of only additives, commercially-pure butane or oxygenate to complying gasoline.

Table 2.1: Regulated Limits for Benzene and the BEN

	Type of Limit	Benzene % by volume	BEN (*)	
			Summer	Winter
Production, Blending and Imports	Flat Limit	1.0	71	92
	Options of Yearly Pool Average YPA Limits	0.95	59.5 (annual average)	
	Not-to-be-exceeded cap	1.5	102	132
Sales	Flat Limit	1.5	N/A	N/A

*Four refineries use alternative (higher) limits for BEN (under subsection 17(2) of the regulations) (see Appendix 2)

All primary suppliers must submit reports annually on the levels of various parameters of gasoline to Environment Canada (quarterly reports were required until the end of 2002). Importers must notify Environment Canada at least 12 hours in advance of their intention to import:

- more than 100 m³ of gasoline at any one time;
- any amount of gasoline-like blendstock; or
- into a province, more than 1000 m³ of gasoline within any one day.

Amendments to the *Benzene in Gasoline Regulations* were published on October 8, 2003. These amendments updated the test method for measuring sulphur content from CAN/CGSB-3.0 No. 16.1 to the more accurate method ASTM D5453. At the same time a number of minor technical changes were also made to update the regulations, clarify some provisions and make the regulations more consistent with other federal fuels regulations. The requirement to notify Environment Canada at least 12 hours in advance of an importers intention to import more than 1000 m³ of gasoline into a province within one day was also added.

2.2 Alternative Limits for the BEN

Under subsection 17(2) of the regulations, a primary supplier could elect before December 1, 1998 to use alternative (higher) limits for the BEN. These alternative limits are based on the historical composition of the primary supplier's gasoline, thereby reflecting its historical BEN number. There is no expiry date for alternative BEN limits, although a primary supplier may rescind the alternative limit at any time. A supplier rescinding its alternative limit would then be subject to the normal limits for BEN.

Petro-Canada and Shell elected to use alternative (higher) limits for the BEN at their Ontario and Quebec refineries. Their alternative limits were set out in a Notice published by the Minister of the Environment in the *Canada Gazette* on September 4, 1999 (see Appendix 2).

2.3 Options for Meeting the Requirements of the Regulations

As discussed in section 2.1, primary suppliers can select either flat or yearly pool average limits for benzene and BEN as the basis for compliance. The options are selected separately for each refining, blending facility and import pool. Table 2.2 shows the number of gasoline pools subject to each type of limit for benzene and the BEN for primary suppliers reporting in 2004.

Table 2.2: Number of Gasoline Pools Subject to Flat and Yearly Pool Average Limits

		Flat Limits	YPA Limits
Benzene	Refineries	1	16
	Blending Facilities	2	0
	Import Pools	4	2
BEN	Refineries	6	11
	Blending Facilities	2	0
	Import Pools	5	1

2.4 Reporting Refineries and Importing Companies

Primary suppliers are required to register with Environment Canada using the *Registration Form for a Manufacturer, Blender or Importer of Gasoline* (Appendix 1). Table 2.3 shows the primary suppliers who were registered with Environment Canada and reported supplying gasoline during 2004. The table also shows the type of limit the supplier is subject to for benzene and BEN: “YPA” if the primary supplier has selected a yearly pool average as its basis for compliance, and “Flat” (flat per-litre limits) otherwise.

Table 2.3: Primary Suppliers Reporting on Gasoline Composition

	Name	Location of Production or Province of Import Facilities	Benzene Limit	BEN Limit
Refiners	Chevron - Burnaby Refinery	Burnaby, BC	YPA	YPA
	Consumers' Co-op	Regina, SK	YPA	Flat
	Husky - Prince George Refinery	Prince George, BC	YPA	YPA
	IOL Dartmouth Refinery	Dartmouth, NS	YPA	Flat
	IOL Nanticoke Refinery	Nanticoke, ON	YPA	Flat
	IOL Sarnia Refinery	Sarnia, ON	YPA	Flat
	IOL Strathcona Refinery	Strathcona, AB	YPA	Flat
	Irving Oil Refinery	Saint John, NB	YPA	YPA
	North Atlantic Refining Ltd.	Come-by-Chance, NF	Flat	Flat
	Petro-Canada Edmonton Refinery	Edmonton, AB	YPA	YPA
	Petro-Canada-Montreal	Montreal, QC	YPA	YPA
	Petro-Canada-Oakville Refinery	Oakville, ON	YPA	YPA
	Shell Montreal Refinery	Montreal, QC	YPA	YPA
	Shell Sarnia Refinery	Sarnia, ON	YPA	YPA
	Shell Scotford Refinery	Scotford, AB	YPA	YPA
	Suncor Energy Products Inc.	Sarnia, ON	YPA	YPA
Ultramar Refinery St. Romuald	St-Romuald, QC	YPA	YPA	
Blenders	Robbins Feed and Fuel	Allanburg, ON	Flat	Flat
	Shell Sherwood Marketing	Edmonton, AB	Flat	Flat
Importers	General Motors of Canada Limited	Oshawa, ON	Flat	Flat
	IOL - Burrard Terminal	Burrard, BC	Flat	Flat
	Petro-Canada- Burrard	Burrard, BC	YPA	YPA
	Petroles Norcan Inc.	Montreal, QC	Flat	Flat
	Suncor - Quebec	Quebec	Flat	Flat
	Ultramar - Holyrood Terminal	Holyrood, NF	YPA	Flat

* Locations submitting "Nil" reports were excluded from this table

3.0 Compliance with the Regulations

This section reviews the compliance of primary suppliers with reporting requirements of the regulations and reported exceedances of the benzene and BEN limits.

3.1 Information Reported

Under section 8 of the regulations, primary suppliers must provide the information set out on the form entitled *Report on the Composition of Gasoline* (refer to Appendix 1). The information includes the maximum and year-to-date average values for a number of composition parameters. Primary suppliers must also report the volume of gasoline, the number of batches supplied, and the name of any oxygenates used. Starting in 2003, the report must be submitted once per year before February 15 of the following year. Prior to 2003, the reports were submitted quarterly.

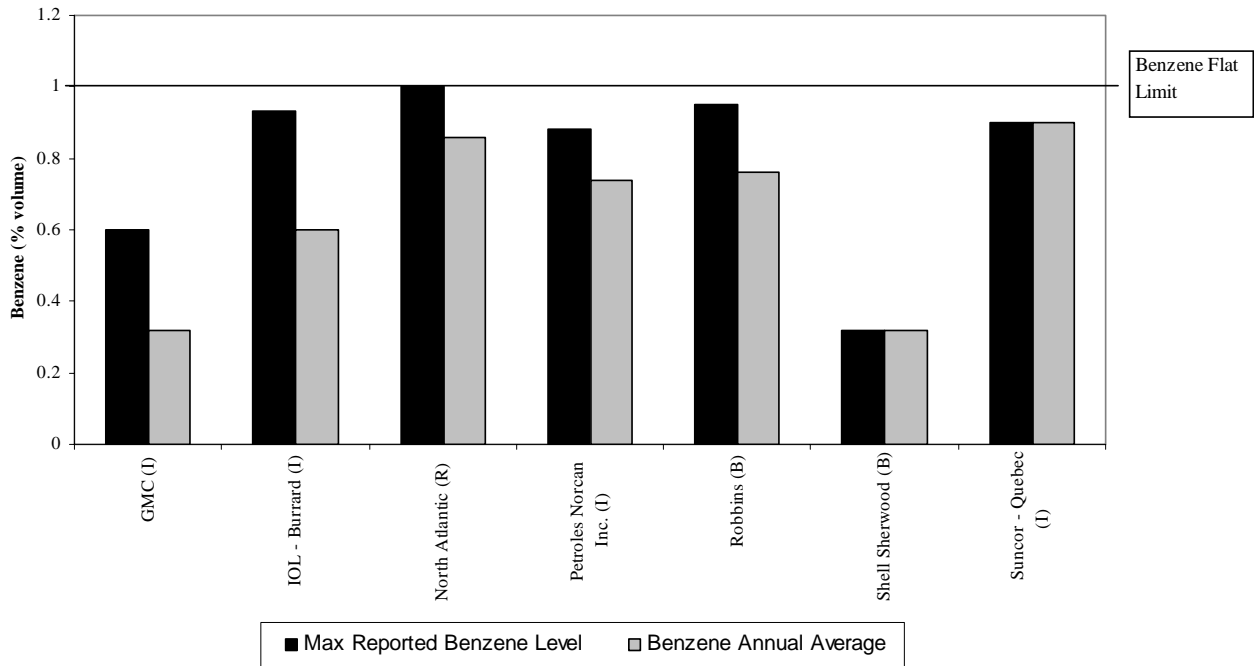
3.2 Exceedances of Regulated Limits

There were no reported exceedances of the Benzene or BEN limit in 2004.

For primary suppliers using flat limits, Figure 3.1 shows the reported maximum and average benzene level and Figure 3.2 shows the reported maximum and average BEN .

For primary suppliers using YPA limits, Figure 3.3 shows the reported average and maximum benzene levels and Figure 3.4 shows the reported average and maximum BEN levels, as a percentage of the regulated limits. The yearly pool average data from Figures 3.3 and 3.4 represent the volume weighted average for all gasoline from a given primary supplier during the year. For Figure 3.4, the y-axis is in units of percent of the regulated limit, as some primary suppliers were on alternative limits.

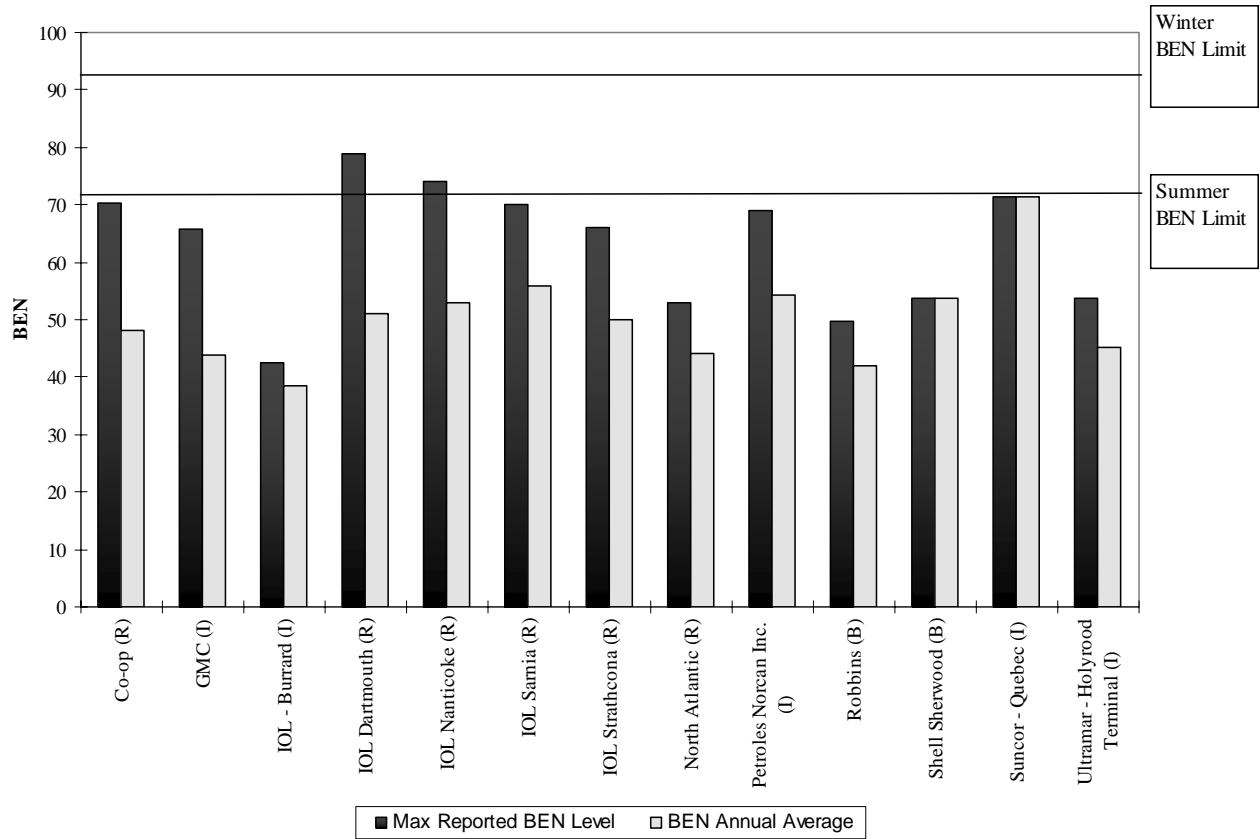
Figure 3.1: Reported Benzene Levels (Maximum and Average) for Suppliers on a Flat Limit, 2004



Notes:

- 1.0% volume = Benzene Flat Limit
- R = Refiner, B = Blender and I = Importer

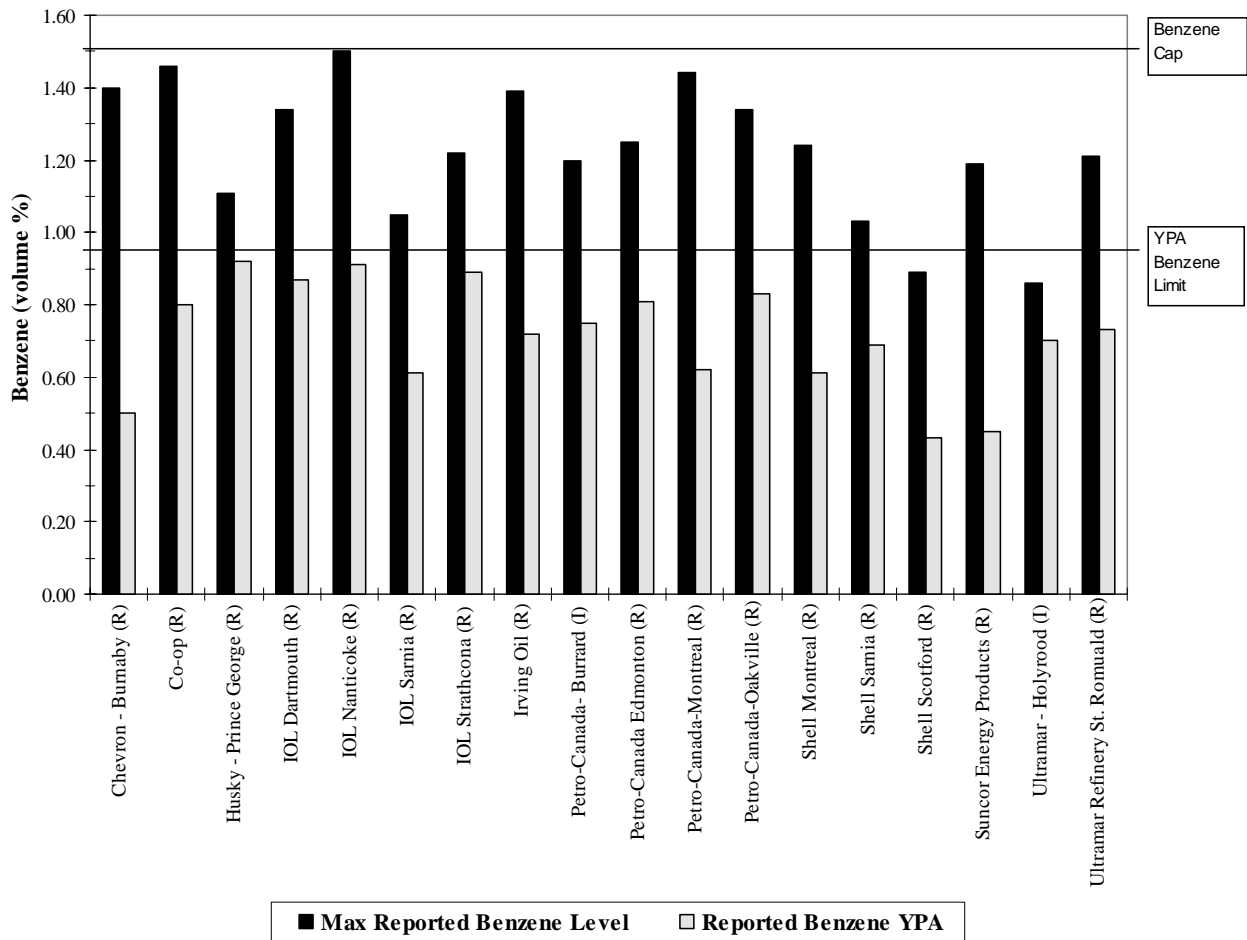
Figure 3.2: Reported BEN (Maximum and Average) for Suppliers on a Flat Limit, 2004



Notes:

- 92 = Flat BEN Winter Limit
- 71 = Flat BEN Summer Limit
- R = Refiner, B = Blender and I = Importer

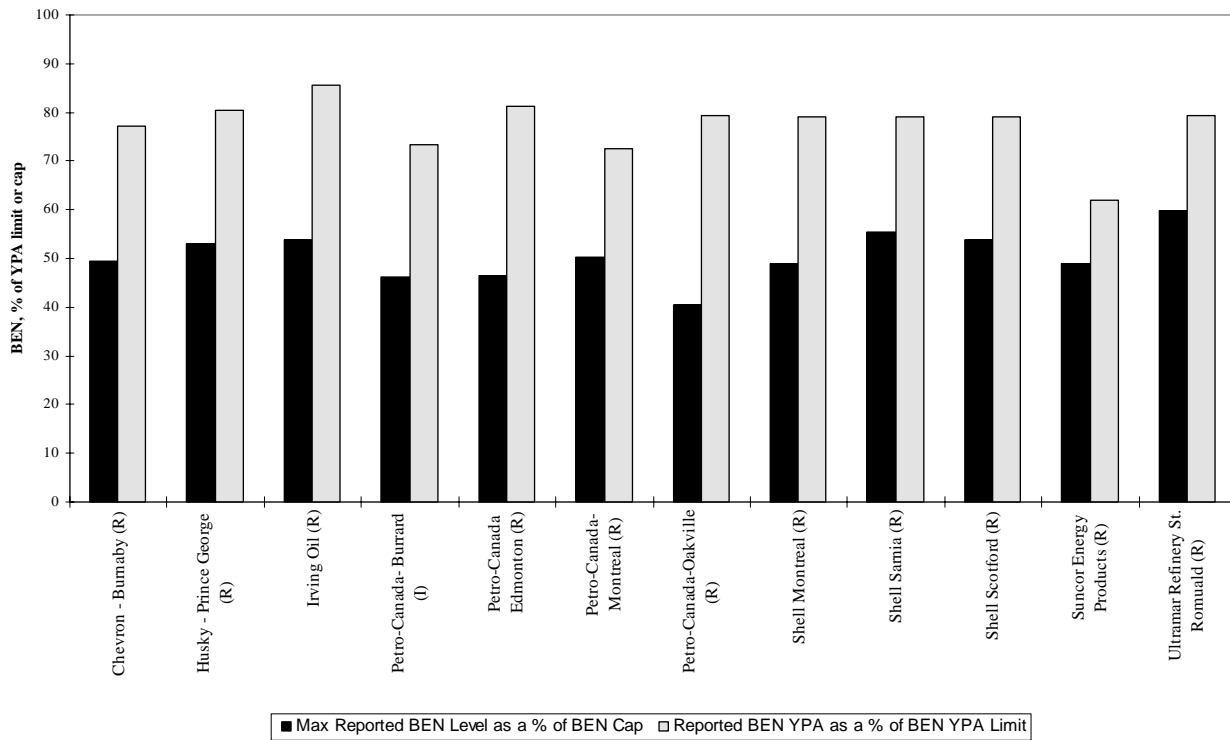
Figure 3.3: Reported Benzene Levels (Maximum and Average) for Suppliers on a Yearly Pool Average Limit, 2004



Notes:

- 0.95% vol. = YPA Benzene Limit
- 1.5% vol. = YPA Benzene Cap
- R = Refiner, B = Blender and I = Importer

Figure 3.4: Reported BEN (Maximum and Average) Levels for Suppliers on a Yearly Pool Average Limit, 2004 (% of limit)



Notes:

- 59.5 = YPA limit, unless a supplier used alternative limits (marked with an *).
- 132 = YPA winter cap, unless a supplier used alternative limits (marked with an *).
- 102 = YPA summer cap, unless a supplier used alternative limits (marked with an *).
- R = Refiner, B = Blender and I = Importer

3.3 Results of Independent Audits

Under section 22 of the regulations, a primary supplier that has elected to use a yearly pool average as its basis for compliance must have an independent auditor perform an audit of the primary supplier's systems, practices and procedures and its compliance with the regulations. The auditor's report must be submitted to Environment Canada by May 31 of the year following the reporting period. This section contains the analysis of the Independent Audits submitted for the 2003 and 2004 reporting periods.

3.4 Summary of 2003 and 2004 Independent Audits

In 2003, twenty-three audits were submitted by ten companies in regard to sixteen refineries, five import pools and two blending facilities. In 2004, twenty-two audits were submitted by nine companies in regard to sixteen refineries, four import pools and two blending facilities. Forty of these audits were combined audits capturing the audit requirements for both the *Benzene in Gasoline Regulations* and the *Sulphur in Gasoline Regulations*. The audits were conducted by six audit companies.

Paragraph 22(3)(e) of the Regulations requires that the audit contain: "*an assessment by the auditor of the extent to which the primary supplier has complied with these Regulations throughout the year of the audit.*" The audits state that all primary suppliers subject to audits met the regulated limits for benzene concentration and BEN.

Eleven audit reports in 2003 and seven audit reports in 2004 identified one or more instance of minor non-compliance with the administrative requirements of the regulations. Many of these involved sampling, testing, compliance plans and reporting. With respect to testing, these included:

- testing equipment was not calibrated regularly;
- quality control samples were not run as required to standard;
- problems with data transfer from laboratory to reporting forms;
- missing samples;
- poor in-house tracking of batch information;
- incorrect sampling volumes; and
- general laboratory quality control programs could not be demonstrated.

With respect to reports required by the regulations, instances of non-compliance included:

- compliance plans were either not updated or were updated without informing the Minister in the required timeframe;
- missed gasoline-like blendstock reporting;
- incorrect reporting on the number of batches, volume and sulphur concentration; and
- late reports.

Many of the recommendations of the auditors related to improving the clarity and updates to the compliance plans, clarification and consistency in reporting procedures, and improvements in laboratory calibration frequency. Fifteen audits reports were accompanied by a list of corrective actions which had been taken by the primary supplier.

Environment Canada views the audits as a crucial component of the enforcement provisions of the regulations and, to be effective, the auditing process must be independent and thorough. The concept of a yearly pool average relies on the maintenance of complete records and reports. The audits are intended to provide Environment Canada assurance that the yearly pool averages are being correctly reported.

4.0 Canadian Gasoline Composition

This section reviews the composition of gasoline in Canada during 2004, based on data reported by primary suppliers pursuant to the regulations. The regulations require that the following parameters are reported:

- the concentration of benzene,
- the value of BEN,
- the concentration of aromatics,
- the concentration of olefins,
- the concentration of sulphur,
- the concentration of oxygen,
- the vapour pressure,
- the evaporation fraction at 93.3 °C (200 °F - E200),
- the evaporation fraction at 148.9 °C (300 °F - E300).

Appendix 3 shows the regional and national concentrations for all parameters. Appendix 4 shows the parameters reported by individual companies.

4.1 Volume of Gasoline

The number of batches and volume of gasoline (excluding exports) reported are summarized in Table 4.1.

Table 4.1: Regional Volumetric Data for 2004

Region	Total Volume (m³)	Number of Batches
Atlantic	2,925,534	360
Quebec	10,710,179	941
Ontario	13,284,470	1325
West*	13,602,771	2,374
National	40,522,954	5,000

*Includes all western provinces and northern territories.

4.2 Regulated Parameters: Benzene and BEN

Data reported on benzene and BEN levels for 2004 are summarized in Table 4.2. The national trend for benzene is shown graphically in Figure 4.1.

Table 4.2: Benzene Concentration and BEN for 2004

Year	Reported Volume Weighted Averages*					
	Benzene (% Volume)			BEN		
	Minimum	Maximum	Canadian Volume Weighted Average	Minimum	Maximum	Canadian Volume Weighted Average
2004	0.32	0.92	0.72	36.9	71.4	49.1

* Includes primary suppliers on alternative limits

Table 4.3 shows the trend in benzene levels between 1995 and 2004⁴. Nationally, benzene levels in 2004 were half of those between 1995 and 1998. These trends are shown graphically for each region and for Canada in Figures 4.1 to 4.5. As the Regulations took effect mid-1999, the data for that year are presented separately for the first and second half of the year. Figures 4.6 and 4.7 show the regional and national average values for benzene and BEN.

Table 4.3: Average Benzene Content of Canadian Gasoline 1995-2004

Region	Average Benzene (volume %)										
	1995	1996	1997	1998	1999		2000	2001	2002	2003	2004
					1st half	2nd half					
Atlantic	2.6	2.5	2.6	2.2	2.1	0.7	0.8	0.9	0.8	0.8	0.8
Quebec	1.6	1.9	1.7	1.7	1.4	1.0	0.6	0.7	0.7	0.7	0.7
Ontario	1.2	1.4	1.3	1.7	1.3	0.8	0.8	0.8	0.7	0.7	0.7
West	1.2	1.3	1.3	1.2	0.7	0.6	0.7	0.7	0.7	0.7	0.7
Canada	1.4	1.6	1.5	1.6	1.2	0.8	0.7	0.7	0.7	0.7	0.7

⁴ The data for 1995 to 1998 were collected from primary suppliers under a voluntary survey of benzene, aromatics and olefins in gasoline. All refiners and a number of importers participated in the survey. Annual reports on the survey were published by Environment Canada.

Figure 4.1: Average Benzene Content of Gasoline – Canada 1995-2004

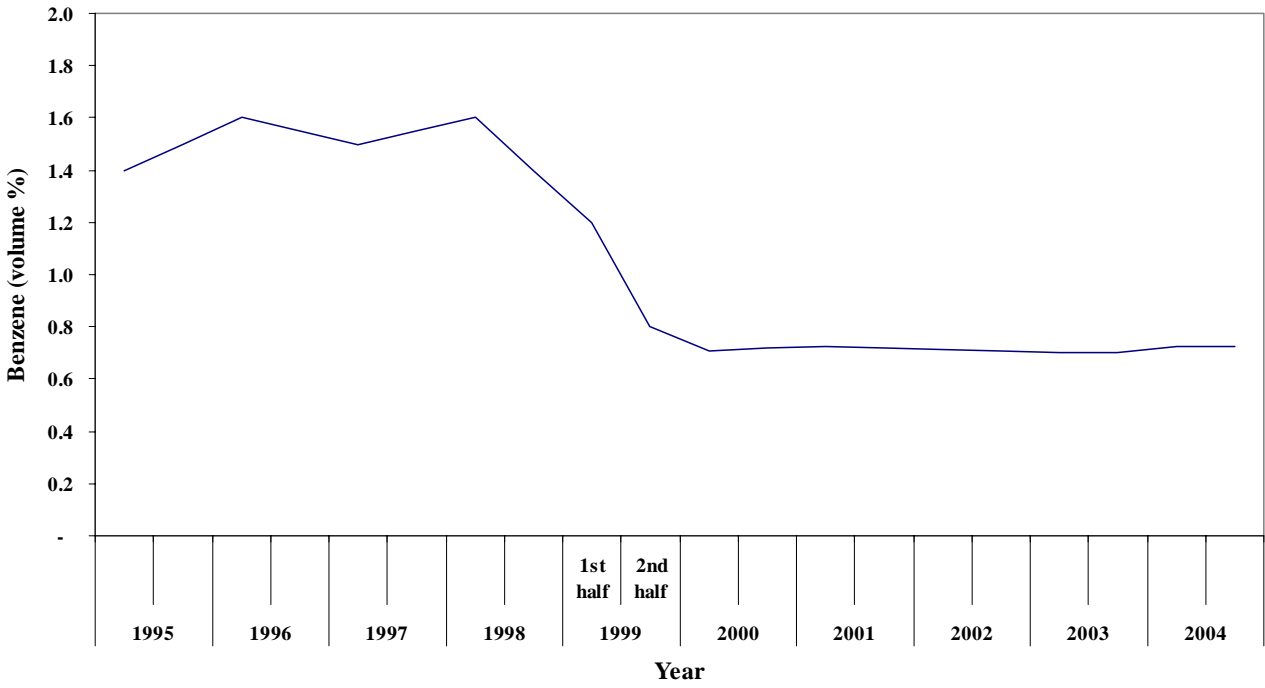


Figure 4.2: Average Benzene Content of Gasoline – Atlantic 1995-2004

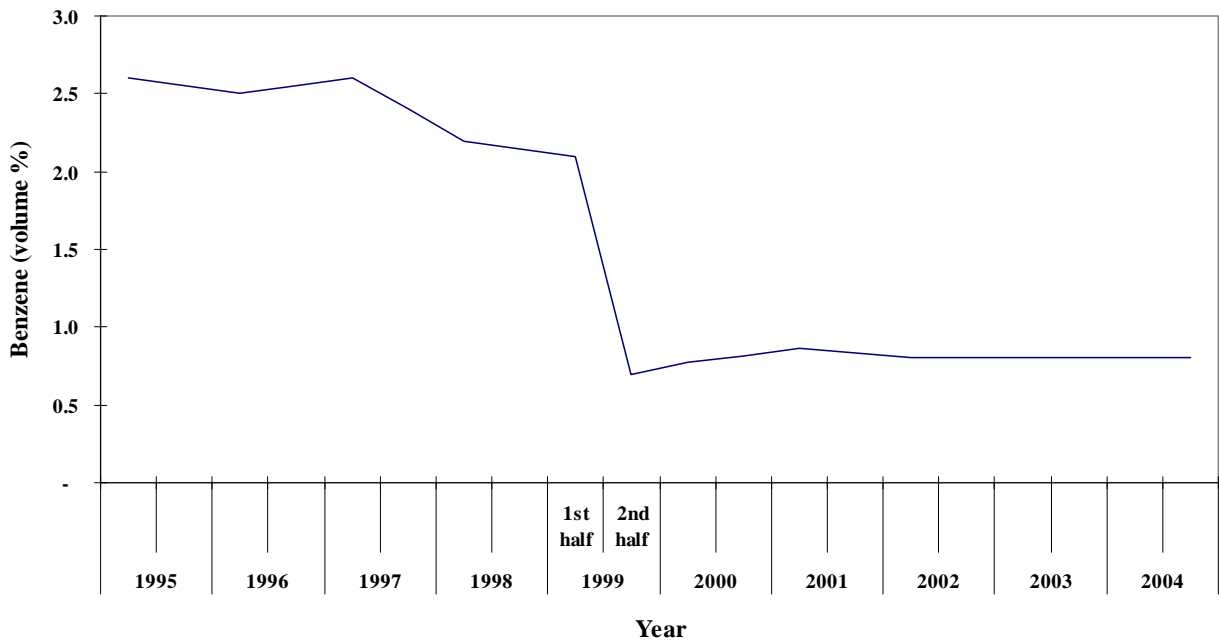


Figure 4.3: Average Benzene Content of Gasoline – Quebec 1995-2004

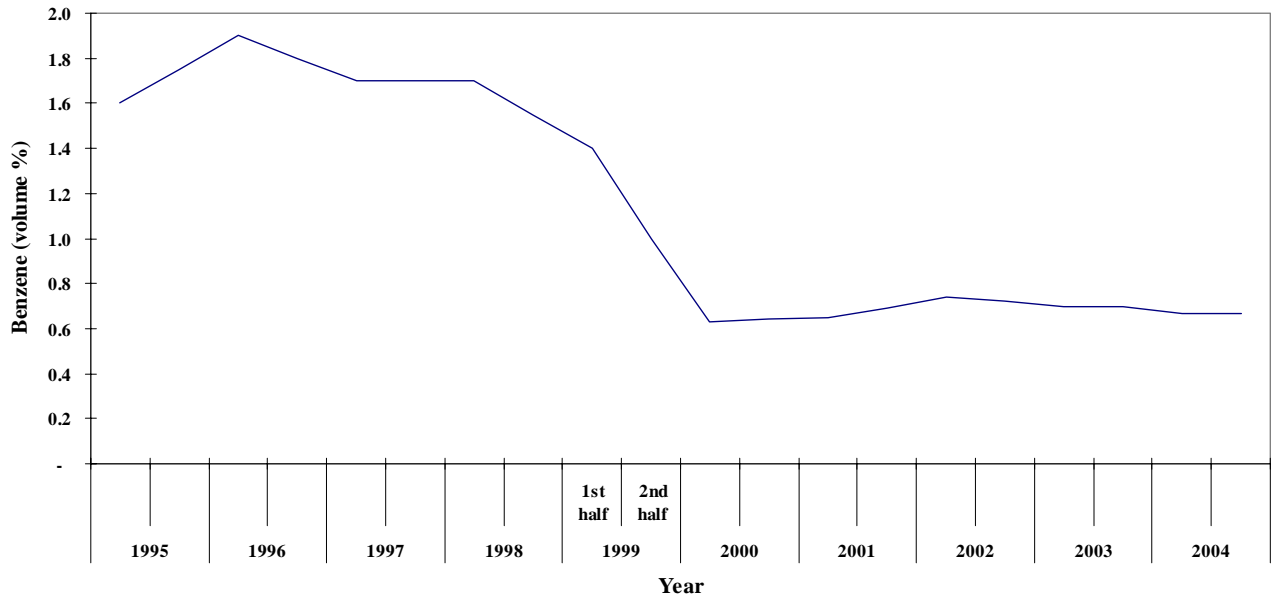


Figure 4.4: Average Benzene Content of Gasoline – Ontario 1995-2004

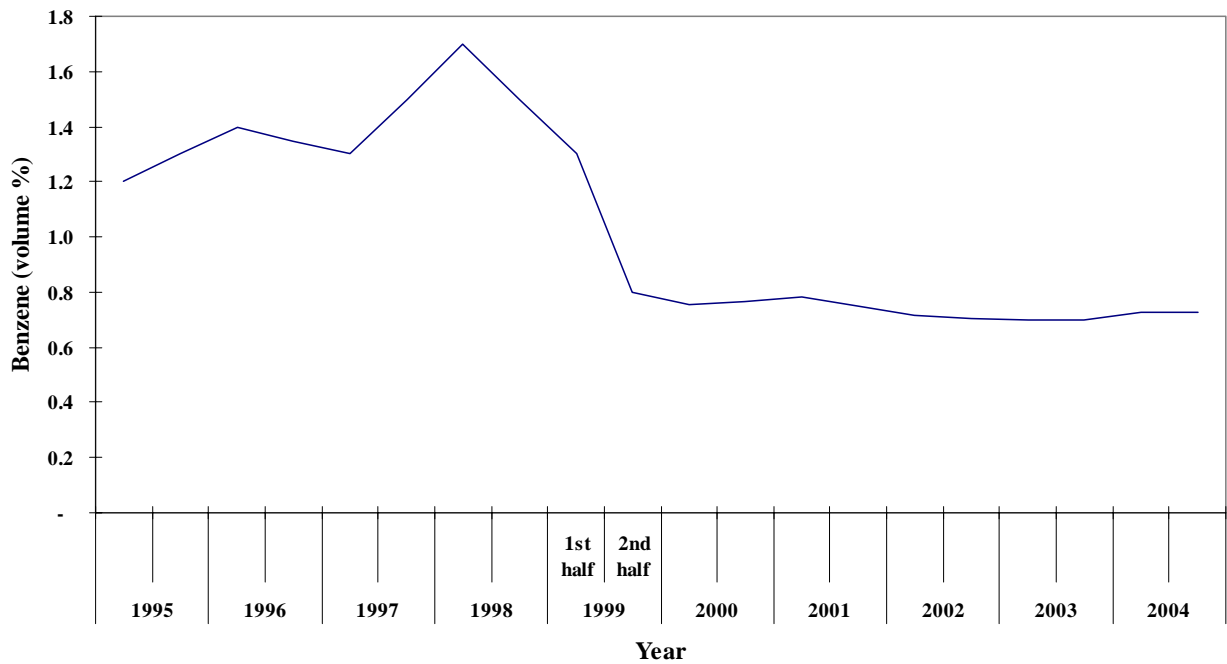


Figure 4.5: Average Benzene Content of Gasoline – West 1995-2004

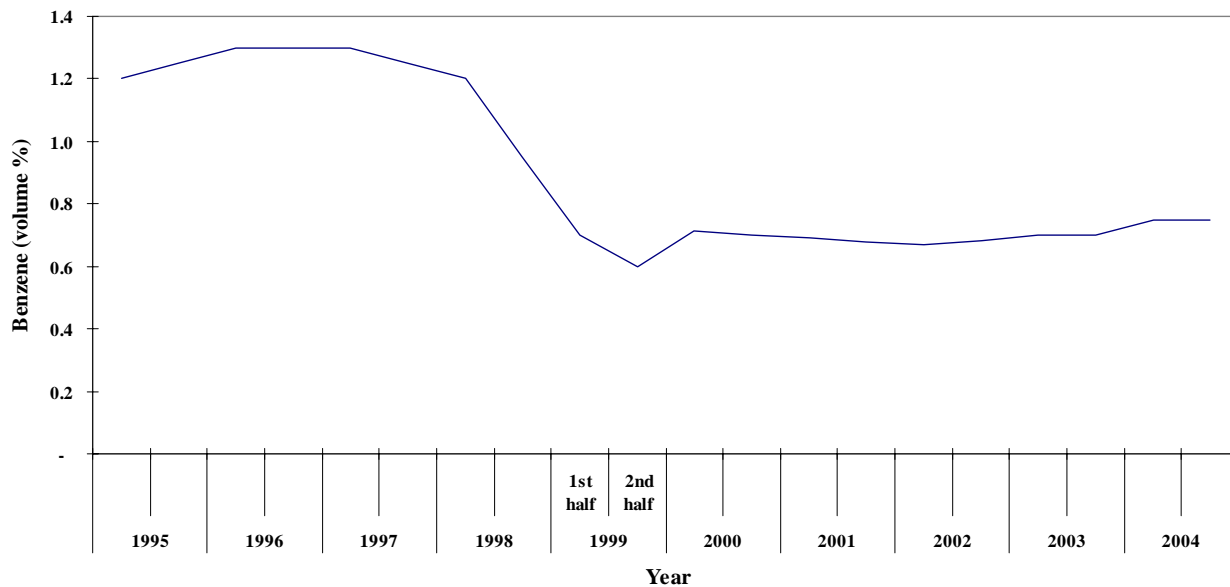
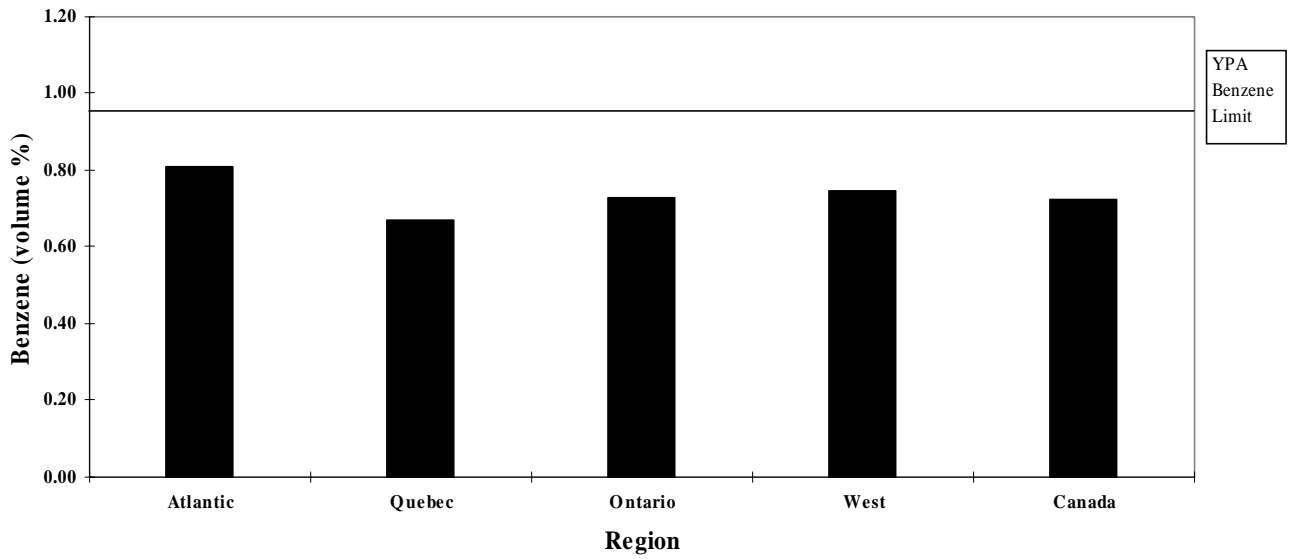


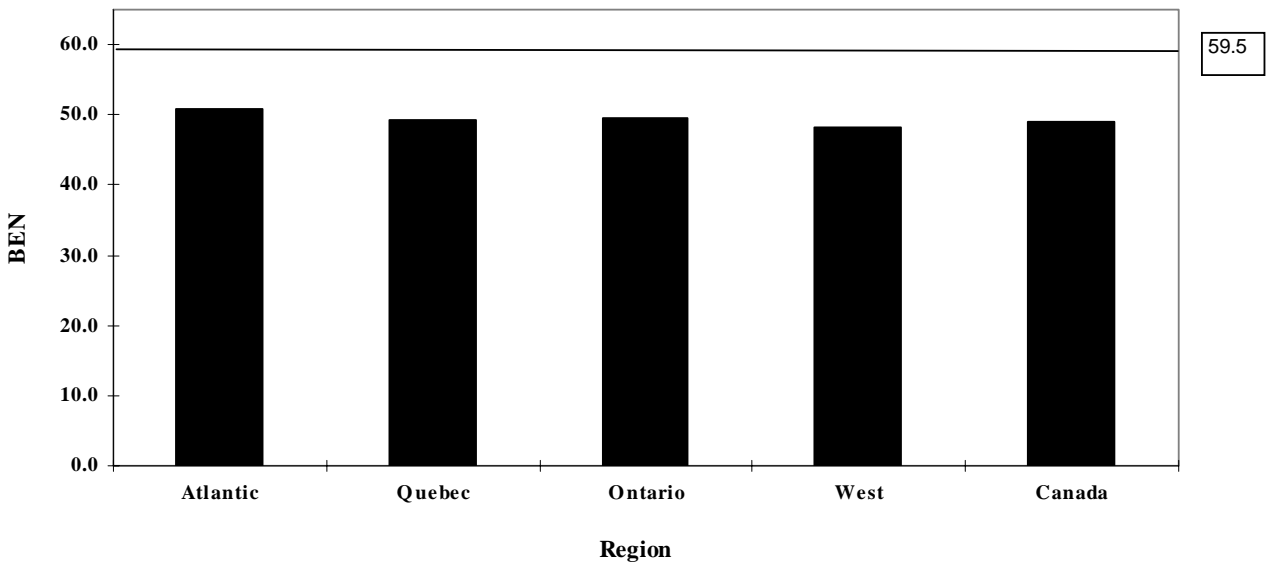
Figure 4.6: Average Benzene Concentration of Canadian Gasoline 2004



Note:

- The annual average Benzene limit for primary suppliers on a YPA is 0.95% vol.

Figure 4.7: Average BEN of Canadian Gasoline 2004



Note:

- The annual average BEN limit for primary suppliers on a YPA is 59.5.

4.3 Reported Oxygen Concentration

Primary suppliers are required to report the type of oxygenate that they use and the oxygen concentration of the gasoline produced or imported. Tables 4.4 and 4.5 summarize the concentrations of MTBE and ethanol, respectively, based on the reported oxygen concentrations and type of oxygenate. Since 2000, the average level of MTBE reported in gasoline produced and imported has decreased by 57%, while for ethanol it has increased by 46%.

Table 4.4: Average Concentration of MTBE Reported

Region	Average Concentration of MTBE based on all volumes of gasoline reported (% by volume)					Maximum Concentration of MTBE based on volumes of gasoline containing MTBE (% by volume)				
	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
Atlantic	0.85	1.13	0.14	0.08	0.06	14.89	15.39	14.83	14.67	14.72
Quebec	0.02	0.08	0.04	0.06	0.22	3.00	7.11	2.22	9.44	9.27
Ontario	0.00	0.00	0.00	0.00	0.00	11.44	12.22	0.28	11.06	2.78
West	0.21	0.01	0.01	0.01	0.00	15.56	0.00	3.33	8.33	1.11
Canada	0.14	0.11	0.02	0.02	0.06	15.56	15.39	14.83	14.67	14.72

Notes:

1. The regulations do not require reporting of oxygenate blended downstream of the refinery (except for a few special incidences described in the regulations). These values are therefore likely to be underestimates of oxygenate usage.
2. 15 % MTBE by volume = approximately 2.7 wt % oxygen.

Table 4.5: Average Concentration of Ethanol Reported

Region	Average Concentration of Ethanol based on all volumes of gasoline reported (% by volume)					Maximum Concentration of Ethanol based on volumes of gasoline containing Ethanol (% by volume)				
	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
Atlantic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Quebec	0.04	0.00	0.01	0.19	0.29	10.00	10.00	10.00	10.00	10.00
Ontario	1.43	1.69	1.81	2.02	1.80	10.00	10.00	10.00	9.73	10.00
West	0.00	0.00	0.0015	0.0000	0.0020	0.57	0.00	10.00	10.00	10.81
Canada	0.46	0.60	0.61	0.60	0.67	10.00	10.00	10.00	10.00	10.81

Notes:

1. The regulations do not require reporting of oxygenate blended downstream of the refinery (except for a few special incidences described in the regulations). These values are therefore likely to be underestimates of oxygenate usage.
2. 10 % ethanol by volume = approximately 3.7 wt % oxygen.

4.4 Trends of Aromatics and Olefins

From 1994 to 1998, data on the benzene, aromatic and olefin concentrations in gasoline were collected by Environment Canada under a voluntary survey. When gasoline is combusted in the vehicle's engine, aromatics in the gasoline can form benzene (a known human carcinogen), while olefins can form 1,3-butadiene (a probable human carcinogen).

Trends for aromatics and olefins content are shown in tables 4.6 and 4.7, respectively⁵. These data show that 2004 national reported levels of aromatics are the highest since 1995 while levels of olefins are the lowest since 1998.

Table 4.6: Average Aromatics Content of Canadian Gasoline 1995-2004

Region	Average Aromatics (volume %)										
	1995	1996	1997	1998	1999		2000	2001	2002	2003	2004
					1st half	2nd half					
Atlantic	31.6	29.4	30.3	31.5	30.8	28.3	28.0	25.9	26.4	26.4	27.8
Quebec	28.5	27.3	24.8	22.0	26.1	27.4	25.4	25.4	26.0	25.5	26.8
Ontario	26.3	28.5	28.1	30.2	27.9	29.0	28.3	27.6	27.0	25.9	29.6
West	24.6	24.5	23.1	24.1	23.9	23.4	23.6	23.5	23.3	24.5	24.6
Canada	26.6	26.9	25.3	26.2	26.2	26.6	25.8	25.5	25.5	25.3	27.0

Table 4.7: Average Olefins Content of Canadian Gasoline 1995-2004

Region	Average Olefins (volume %)										
	1995	1996	1997	1998	1999		2000	2001	2002	2003	2004
					1st half	2nd half					
Atlantic	-	-	8.7	13.6	11.7	14.1	15.1	17.4	17.7	16.2	14.7
Quebec	-	-	14.1	12.5	13.3	14.2	13.6	14.1	13.4	13.4	11.8
Ontario	-	-	10.2	9.4	10.8	9.7	10.3	10.4	9.5	8.7	8.4
West	-	-	10.9	9.8	9.4	10.2	10.1	10.9	10.7	11.1	10.1
Canada	-	-	11.2	10.6	11.0	11.4	11.4	12.1	11.5	11.4	10.3

(-) = not available, olefins were not part of the survey until 1997.

⁵ The data for 1995 to 1998 were collected from primary suppliers under a voluntary survey of benzene, aromatics and olefins in gasoline. All refiners and a number of importers participated in the survey. Annual reports on the survey were published by Environment Canada.

4.5 Comparison of Imported vs. Domestic Gasoline

Table 4.8 compares the data provided by refiners and importers. As was shown in Table 2.3, flat limits were selected by the majority of importers while the YPA option was selected by the majority of refiners. As shown in Table 4.8, importers reported lower maximum values for all parameters and lower average values for oxygen, vapour pressure, benzene and BEN.

Table 4.8: Comparison of Reported Maximum and Average Values Importers and Refiners (for All Reported Parameters)

Parameter	Reported Maxima		Average Reported	
	Importers	Refiners	Importers	Refiners
Oxygen (wt %)	1.67	4.00	0.19	0.25
Sulphur (mg/kg)	235	295	85	62
Vapour Pressure (kPa)	98.9	118.0	62.7	85.2
E200 (vol %)	69.3	69.9	51.0	49.7
E300 (vol %)	96.9	97.0	86.3	84.1
Aromatics (vol %)	42.3	51.4	28.7	27.0
Olefins (vol %)	23.8	31.7	11.9	10.3
Benzene (vol %)	1.20	1.50	0.72	0.73
BEN	71.4	81.9	48.4	49.1

5.0 Other Gasoline Quality Information

5.1 The Gasoline Regulations

The Regulations respecting concentrations of lead and phosphorus in gasoline (The *Gasoline Regulations*)⁶ limit the concentration of lead in gasoline that is produced, imported, sold or offered for sale in Canada to 5 mg/L and limit the concentration of phosphorus in unleaded gasoline to 1.3 mg/L. The limit for lead in gasoline for use in specialized equipment such as farming, boats and large trucks is 30 mg/L. Gasoline for use in aircraft is exempt from the Regulations and, until January 1, 2008, leaded gasoline for use in competition vehicles is not subject to the lead concentration restrictions.

The *Gasoline Regulations* were passed in 1990, virtually eliminating the use of lead additives in gasoline. The Regulations were passed in response to the 1986 Royal Society of Canada Commission on Lead in the Environment, which recommended to the Government of Canada that “Public health and environmental policy should be to reduce blood lead to its lowest possible level”. Of particular concern were emissions of lead particles to the atmosphere, of which the largest source was gasoline lead particulates from the combustion of tetraethyl lead and tetramethyl lead, antiknock additives that were commonly used in gasoline.

⁶ SOR/90-247, as amended by SOR/92-587, SOR/94-355, SOR/97-147, SOR/98-217, SOR/2000-104, and SOR/2003-106; a copy of the regulations can be found at <http://www.ec.gc.ca/CEPARRegistry/regulations>

Under the *Gasoline Regulations*, producers, importers or sellers of leaded gasoline must submit reports to the Minister of the Environment as follows:

- Every person who produces or imports leaded gasoline for use or sale in Canada (excluding gasoline used for competition vehicles) is required to submit quarterly reports, within 15 days of the last day of each quarter, indicating the:
 - quantity of leaded gasoline produced/imported by grade;
 - quantity of lead added by grade; and
 - average lead concentration.

- Every person who produces, imports or sells (or offers for sale) in Canada leaded gasoline for use in competition vehicles is required to make and maintain records, which must be submitted annually to the Minister of the Environment, on or before March 31 of the year following the year the activity occurred. These records must include:
 - the brand name of the gasoline;
 - the octane rating and the method used for determining the octane rating of the gasoline;
 - the average yearly lead concentration in milligrams per litre (mg/L) of the gasoline for each brand name;
 - if the gasoline was sold for resale or distribution, the name and address of the re-seller or distributor;
 - if the gasoline was sold at a track or event location, the name and address of the track or event location where the gasoline was used; and
 - quantities of leaded gasoline produced, imported, sold or offered for sale.

For the 2004 reporting period, 5 companies submitted records of imports of leaded gasoline for use in competition vehicles. The total volume of leaded gasoline imported was 1,887,170 L. The reported average lead concentrations of that gasoline ranged from 0.2 to 2.1 g/L. Table 5.1 summarizes number of companies reporting imports of leaded gasoline for use in competition vehicles for each region for 2004.

Table 5.1 Number of Companies Reporting Volumes of Gasoline Imported for Use in Competition Vehicles

Region	Number of Companies
Atlantic	0
Ontario	0
Quebec	1
West*	3
Unspecified province	1
National	5

*Includes all western provinces and northern territories.

There were no quarterly reports received for 2004 from producers or importers of leaded gasoline for uses other than in competition vehicles.

Appendix 1

Annual Compliance Package with Sample
Reporting Forms for the
Benzene in Gasoline Regulations;
& Gasoline Regulations



Benzene in Gasoline Regulations

NOTE: Information contained in this page is for compliance promotional purposes and has NO legal status. For requirements under the regulations, refer to the actual regulations.

These regulations apply to importers, manufacturers and blenders of gasoline. They also apply to anyone that sells gasoline or offers it for sale.

The regulations prohibit the production or import of gasoline with a benzene content exceeding 1.0% by volume. They also restrict the Benzene Emissions Number (BEN), a calculated parameter that relates gasoline composition to predicted emissions of benzene from vehicle tailpipes to a maximum of 71 in the summer and 92 in the winter. Companies may elect to meet annual pooled averages for benzene and BEN, in place of the above limits.

The regulations also prohibit the sale of gasoline with more than 1.5% by volume of benzene.

Various reporting and record-keeping requirements are specified in different sections of the Regulations. For instance:

- Section 6 requires that information on alternative sampling or analysis methods be submitted **60** days prior to use.
- Section 7 specifies that **registration as per Schedule 2** is required with Environment Canada **15 days prior** to commencing operations for new refiners, importers or blenders (a copy of Schedule 2 is attached for your convenience).
- Section 8 requires every primary supplier to submit gasoline composition reports due annually on February 15. A copy of Schedule 3 is attached for your convenience.
- Section 12 specifies additional reporting requirements for importers. A page summarizing the reporting requirements is attached for your convenience.
- Subsection 21(2) requires that a compliance plan be signed by an authorized official of the primary supplier and sent to the Minister by registered mail or courier at least 150 days before the beginning of the first year (i.e. by August 4) for which the primary supplier has elected to meet a requirement on the basis of a yearly pool average. Any changes to the compliance plan require at least 45 days notice to the Minister as per subsection 21(3).
- Subsection 22(3) requires that auditor's reports for those on a yearly pool average be submitted each year by May 31.

Further details on the above are contained in an Environment Canada guidance document entitled "Questions and Answers on the Federal *Benzene in Gasoline Regulations* (May 27, 1998)". For a copy of this document, please refer to following website:

<http://www.ec.gc.ca/CEPARRegistry/regulations/>



This form is provided for your convenience. Please refer to the *Canadian Environmental Protection Act* and the *Benzene in Gasoline Regulations* for information on requirements.

SCHEDULE 2
(Section 7)
REGISTRATION FORM FOR A MANUFACTURER, BLENDER OR IMPORTER OF GASOLINE

Mail To: appropriate regional office of Environment Canada (see back page)

1. Company Name: _____

Company Address: _____

Type of primary supplier (check one or more): Manufacturer Blender Importer

2. Name and location of each refinery and typical annual volume, in m³, of each type of gasoline manufactured at each refinery:

3. Name and location of each blending facility, typical blending material(s) and typical annual volume, in m³, of each type of gasoline blended at each facility: (For cargo tankers, railway cars, boats, marine vessels or other mobile blending facilities, indicate only the type and number of mobile facilities and the province of operation.)

4. Each usual point and mode of importation and typical annual volume, in m³, of each type of gasoline imported:

5. Authorized official: _____

Telephone no. (____) _____ - _____

Title: _____

Fax no. (____) _____ - _____

Signature: _____

Date: _____



NOTES -- BENZENE IN GASOLINE REGULATIONS

- A. This Report on Composition of Gasoline must be submitted separately for each refinery, blending facility and province of importation, or any combination of them described under section 18 of the *Benzene in Gasoline Regulations*.
- B. For Note A, the name and location for cargo tankers, railway cars, boats, marine vessels or other mobile blending facilities are replaced by the type of mobile facilities, their number and the province of operation, or the name and location of the non-mobile facility with which they are grouped.
- C. The average benzene emissions number is the volume-weighted average of the benzene emissions numbers for each batch; it is not calculated from the average model parameters.
- D. Under subsection 13(2) of the *Benzene in Gasoline Regulations*, for each batch of gasoline-like blendstock dispatched or imported by the primary supplier during the period covered by this Report, the primary supplier must report to the Minister, in an annex to this Report, the name and address of the purchaser or receiver, the date of dispatch or importation and the volume.
- E. Under subsection 2(2) of Schedule 1 to the *Benzene in Gasoline Regulations*, the primary supplier must report to the Minister, in an annex to this Report, each occurrence of a model parameter that is outside the acceptable range, the reason for each occurrence, and the volume of gasoline affected.
- F. Authorized official is a defined term (refer to subsection 1(1) of the *Benzene in Gasoline Regulations*).

Additional Requirements for Importers as per Section 12 of the *Benzene in Gasoline Regulations*

NOTE: Information contained in this page is for compliance promotional purposes and has no legal status. For requirements under the regulations, refer to the actual regulations.

Subsection 12(1) Every importer must notify the Minister, at least 12 hours before the time of importation, of the importer's intention to import:

- a) at any one time more than 100 m³ of gasoline identified under subsection 9(1) or (2) as complying gasoline, U.S. reformulated gasoline, California gasoline or northern winter complying gasoline; or
- b) at any one time, any amount of gasoline identified under subsection 9(1) as gasoline-like blendstock; or
- c) **into a province and within any one day, more than 1,000 m³ of gasoline identified under subsection 9(1) or (2) as complying gasoline, U.S. reformulated gasoline, California gasoline or northern winter complying gasoline (amended 2003)**

Subsection 12(2) The notice required by subsection (1) must include:

- a) the name and registration number of the importer;
- b) the type of gasoline identified under subsection 9(1), unless it is complying gasoline;
- c) the volume of the gasoline that is scheduled to be imported;
- d) the point of entry of the gasoline into Canada and the estimated date and time* that it will enter Canada;
- e) the address of the first storage facility or refueling facility to which the gasoline is to be delivered and the estimated date and time of its delivery there; and
- f) the name and telephone number of a representative of the importer through whom sampling arrangements can be made.

* Provide the best estimated date and time with your notice; revise when more accurate date and time become available.
(A form containing above noted requirements is attached for your convenience)

Subsection 12(3) No importer shall import gasoline by cargo tanker, railway car, boat, marine vessel or aircraft unless the gasoline is accompanied at the point of entry into Canada and at the point of delivery, and everywhere between those points, by a record that shows:

- a) the name, address and registration number of the importer;
- b) the name and address of the person to whom the gasoline is to be sold or ownership transferred;
- c) the address of the first storage facility or refueling facility to which the gasoline is to be delivered;
- d) the volume of the gasoline; and
- e) the type of gasoline identified under subsection 9(1), unless it is complying gasoline.



This form is provided for your convenience. Please refer to the *Benzene in Gasoline Regulations* for information on requirements.

Additional Requirements under section 12 of the *Benzene in Gasoline Regulations for Importers* intending to import at any one time more than 100 m³ of gasoline or more than 1000 m³ into a province in one day. Note **no** minimum for gasoline-like blendstock.

Notification: via fax at least 12 hours before the time of importation to the appropriate regional office of Environment Canada (see back page)

a) Importer Name: _____

Importer Registration Number: _____

Batch Number (Optional): _____

b) Type of gasoline identified under Section 9, check or mark "x" below:

Complying gasoline	[]	California gasoline	[]
Gasoline-like blendstock	[]	Northern winter complying gasoline	[]
US reformulated gasoline	[]		

c) Scheduled volume of gasoline (m³): _____

d) Point of entry into Canada: _____

Estimated date _____ and time of entry _____

e) Address of first storage facility or refueling facility to whom gasoline is to be delivered:

Estimated date of delivery _____ and time of delivery _____

f) Importer's representative through whom sampling may be arranged:

Name (Print): _____, Telephone: _____

Following To Be Completed by Environment Canada (PLEASE PRINT):

Environment Canada Official receiving or reviewing information:

Name: _____ Signature: _____

Date: _____ Telephone: (_____) _____ -- _____



Gasoline Regulations

NOTE: Information contained in this page is for compliance promotional purposes and has no legal status. For requirements under the regulations, refer to the actual regulations.

These Regulations specify the allowable lead and phosphorus content in leaded and unleaded gasoline that is produced, imported, sold or offered for sale in Canada. Gasoline for use in aircraft is exempted. The regulations do not apply to gasoline for use in competition vehicles, as defined by the regulations, except for the record and reporting requirements of section 11.

Leaded Gasoline reporting

Producers and importers of leaded gasoline for use or sale in Canada must submit quarterly reports to the Minister of the Environment detailing quantities produced and imported, as well as lead concentrations. These reports must be submitted within 15 days after the last day of each calendar quarter in which the activity occurred. Records of the sales of this gasoline must be retained in Canada for a period of two years after the date the record is made. Note that this requirement does not pertain to leaded gasoline for use in competition vehicles.

Leaded Gasoline used in Competition Vehicles reporting

For leaded gasoline used in competition vehicles, annual detailed reports indicating, among other things, quantities imported, produced and distributed, as well as the lead concentrations, must be submitted to the Minister of the Environment by March 31 of the year following the year in which the activity occurred. Records detailing these activities must be kept in Canada for a period of five years after the date the record is made. Example templates in paper form for company identification and record keeping (for leaded gasoline import, production, sales, re-sales and distribution information) are attached for your convenience. Electronic versions of the templates (in Excel) are also available. The required information is to be mailed to the appropriate regional office of Environment Canada (see back page)



Leaded Gasoline For Competition Vehicles
Annual Reporting for Gasoline Regulations
Canadian Environmental Protection Act, 1999

Company Identification and Declaration

Company Information

Company Name: _____

Address: _____

City: _____ Prov.: _____

Postal Code: _____

Ph: (____) _____ - _____

Fax: (____) _____ - _____

Contact Information

Name: _____

Title: _____

Address: _____

City: _____ Prov.: _____

Postal Code: _____

Ph: (____) _____ - _____

Fax: (____) _____ - _____

(to be completed if contact address differs from company address)

Calendar year: 2004

Non Involvement

In the above indicated calendar year, I did not produce, import, distribute, re-sell, sell or offer for sale leaded gasoline for use in competition vehicles. In this case, please complete this form and return it to the address listed below.

Involvement

In the above indicated calendar year, I produced, imported, distributed, re-sold, sold or offered for sale leaded gasoline for use in competition vehicles. The reports for these activities are attached.

Confidential

Pursuant to subsection 313(1) of the *Canadian Environmental Protection Act, 1999*, I request that the following information for the above calendar year be treated as confidential (please specify your reasons).

Not Confidential

I do not request the following information be treated as confidential and I consent to it being released without restriction.

Signature

Name (please print)

Title

Place and date

Please complete, include your records and return to:
appropriate regional office of Environment Canada (see back page)



Leaded Gasoline For Competition Vehicles

Record Keeping for *Gasoline Regulations*
Canadian Environmental Protection Act, 1999

Leaded Gasoline Import/Production Information

Date	Brand Name	Octane Rating/ Analysis Method ¹	Average Lead Concentration (mg/L)	Quantity Imported (L)	Quantity Produced (L)

1. Please indicate for Octane Rating and Analysis Method: R - Research Octane Number; M - MotorOctane Number; or, A - Anti-Knock Index



Leaded Gasoline For Competition Vehicles

Record Keeping for *Gasoline Regulations*
Canadian Environmental Protection Act, 1999

Leaded Gasoline Import/Production Information

Date	Brand Name	Octane Rating/ Analysis Method ¹	Average Lead Concentration (mg/L)	Quantity Imported (L)	Quantity Produced (L)

1. Please indicate for Octane Rating and Analysis Method: R - Research Octane Number; M - Motor Octane Number; or, A - Anti-Knock Index



Leaded Gasoline For Competition Vehicles
Annual Reporting for Gasoline Regulations
Canadian Environmental Protection Act, 1999

Company Identification and Declaration

Company Information

Company Name: _____

Address: _____

City: _____ Prov.: _____

Postal Code: _____

Ph: (____) _____ - _____

Fax: (____) _____ - _____

Contact Information

Name: _____

Title: _____

Address: _____

City: _____ Prov.: _____

Postal Code: _____

Ph: (____) _____ - _____

Fax: (____) _____ - _____

(to be completed if contact address differs from company address)

Calendar year: 2004

Non Involvement

In the above indicated calendar year, I did not produce, import, distribute, re-sell, sell or offer for sale leaded gasoline for use in competition vehicles. In this case, please complete this form and return it to the address listed below.

Involvement

In the above indicated calendar year, I produced, imported, distributed, re-sold, sold or offered for sale leaded gasoline for use in competition vehicles. The reports for these activities are attached.

Confidential

Pursuant to subsection 313(1) of the *Canadian Environmental Protection Act, 1999*, I request that the following information for the above calendar year be treated as confidential (please specify your reasons).

Not Confidential

I do not request the following information be treated as confidential and I consent to it being released without restriction.

Signature

Name (*please print*)

Title

Place and date

Please complete, include your records and return to:
appropriate regional office of Environment Canada (see back page)

Appendix 2

Alternative Limits under the *Benzene* *in Gasoline Regulations*

GOVERNMENT NOTICES**DEPARTMENT OF THE ENVIRONMENT***Alternative Limits under the Benzene in Gasoline Regulations*

This notice provides information on alternative limits that have been approved by the Minister of the Environment under the federal *Benzene in Gasoline Regulations*.

The federal *Benzene in Gasoline Regulations* set limits for the level of benzene in gasoline and for a parameter called the benzene emissions number (BEN). The BEN relates gasoline composition to the estimated emissions of benzene from vehicles. The limits under the Regulations came into effect on July 1, 1999.

Under subsection 17(2) of the *Benzene in Gasoline Regulations*, primary suppliers of gasoline (refiners, blenders and importers) could elect to be subject to alternative limits for the BEN, based on their historical gasoline composition. Under subsection 16(2), primary suppliers unable to meet the July 1, 1999, implementation date could also apply to be subject to temporary (higher) limits for both benzene and the BEN for up to six months.

Temporary Limits under Subsection 16(2)

Under subsection 16(2) of the Regulations, primary suppliers may apply for temporary alternative limits for benzene and the BEN if, for reasons beyond their control, they cannot meet the implementation date of July 1, 1999. Primary suppliers may only use the temporary limits until December 31, 1999. Under subsection 16(4) of the Regulations, the Minister of the Environment approves these applications only if:

- the primary supplier has made all reasonable efforts to meet the implementation date of July 1, 1999; and
- that non-authorization of the temporary limits would
- have a significant effect on the supply of gasoline or other petroleum products in the region,
- require the primary supplier to significantly curtail operations or cease operating for a period of time and thereby result in financial hardship, or
- result in the primary supplier going out of business.

In the Regulatory Impact Analysis Statement that accompanied amendments to the *Benzene in Gasoline Regulations*, published in the *Canada Gazette*, Part II, on May 26, 1999, the Minister of the Environment announced her intention to “publish a notice in *Canada Gazette* Part I identifying the company, its alternative limits, and the period that the limits apply”. Pursuant to that intention, the following tables show the temporary alternative limits for benzene and the BEN that have been applied for and approved. It should be noted that under the Regulations, companies can elect to meet the requirements on the basis of yearly pool average limits with associated never-to-be-exceeded caps, rather than meeting “flat” never-to-be-exceeded limits.

AVIS DU GOUVERNEMENT**MINISTÈRE DE L'ENVIRONNEMENT***Limites de remplacement en vertu du Règlement sur le benzène dans l'essence*

Cet avis fournit de l'information sur les limites de remplacement approuvées par la ministre de l'Environnement en vertu du *Règlement sur le benzène dans l'essence*.

Le *Règlement sur le benzène dans l'essence* du gouvernement fédéral établit des limites pour la teneur en benzène de l'essence et pour un paramètre appelé indice des émissions de benzène (BEN). Le BEN relie la composition de l'essence à l'estimation des émissions de benzène provenant des véhicules. Les limites en vertu du Règlement sont entrées en vigueur le 1^{er} juillet 1999.

En vertu du paragraphe 17(2) du *Règlement sur le benzène dans l'essence*, un fournisseur principal d'essence (raffineur, mélangeur ou importateur) peut choisir d'être assujéti à des limites de remplacement pour le BEN en fonction de l'historique de la composition de son essence. En vertu du paragraphe 16(2), un fournisseur qui est incapable de se conformer à la date de mise en vigueur du 1^{er} juillet 1999 peut aussi demander d'être assujéti à des limites temporaires (plus élevées), et pour le benzène et pour le BEN, pour une durée maximum de six mois.

Limites temporaires en vertu du paragraphe 16(2)

En vertu du paragraphe 16(2) du Règlement, un fournisseur principal peut demander des limites de remplacement temporaires pour le benzène et le BEN si, pour des raisons hors de son contrôle, il ne peut se conformer à la date de mise en vigueur du 1^{er} juillet 1999. Il ne peut utiliser les limites temporaires qu'au plus tard le 31 décembre 1999. En vertu du paragraphe 16(4), la ministre de l'Environnement n'approuve cette demande qu'à condition que :

- le fournisseur principal ait fait tous les efforts raisonnables pour se conformer à la date de mise en vigueur du 1^{er} juillet 1999;
- le refus d'autorisation des limites temporaires occasionne :
- soit un impact considérable sur l'approvisionnement en essence ou autres produits pétroliers dans la région,
- soit une réduction considérable des activités d'exploitation du fournisseur principal ou un arrêt pour une période de temps, ce qui causerait des difficultés financières,
- soit le retrait du marché du fournisseur principal.

Dans le résumé de l'étude d'impact de la réglementation qui accompagne les modifications au *Règlement sur le benzène dans l'essence*, publiées dans la Partie II de la *Gazette du Canada* le 26 mai 1999, la ministre de l'Environnement a annoncé son intention de publier « un avis dans la *Gazette du Canada* Partie I indiquant le nom de la compagnie, ses limites de remplacement, et la période au cours de laquelle les limites s'appliqueraient ». Conformément à cette intention, les tableaux suivants démontrent les limites de remplacement temporaires pour le benzène et le BEN qui ont été demandées et approuvées. Il est à remarquer qu'en vertu du Règlement, une compagnie peut choisir de se conformer en fonction de limites de moyennes annuelles incluant des plafonds à ne jamais dépasser au lieu de se soumettre à des limites « simples » à ne jamais dépasser.

Temporary Limits for Primary Suppliers having Elected to use Yearly Pool Averages

Company	Refinery or province of importation	Temporary yearly pool average limits (all expire on December 31, 1999)		Expiry date for temporary never-to-be-exceeded caps
		<i>Benzene (% vol.)</i> BEN	Temporary never-to-be-exceeded caps <i>Benzene (% vol.)</i> BEN	
Petro-Canada	Montréal refinery	1.28% 76.4	4.61% 156.8/198.1	November 15, 1999
Shell	Montréal refinery	2.0% 86.8	4.7% 117.8/220.0	November 15, 1999
Ultramar	Québec refinery and Montréal terminal	1.2% —	3.55% —/134.8	November 15, 1999
Pétroles Norcan	Imports into Quebec	1.54% 66.68	3.0% —	November 15, 1999
Petro-Canada	Oakville refinery	1.75% 80.4	4.29% 140.6/—	September 15, 1999
<i>Standard limits under subsections 16(1) and 17(1)</i>				
Standard limits	Benzene BEN	0.95% 59.5	1.5% 102/132	

Temporary Limits for Primary Suppliers Subject to "Flat" Limits

Company	Refinery or province of importation	Temporary flat (per-litre) limit		Expiry date for temporary flat limit
		<i>Benzene (% vol.)</i>	BEN	
Olco/Neste	Imports into Quebec and Ontario	3.0%	—	November 15, 1999
Spur/Murphy	Imports into Ontario	2.06%	—	September 15, 1999
Parkland	Bowden refinery	1.5%	—	December 31, 1999
<i>Standard limits under subsection 3(1) and section 4</i>				
Standard limits		1.0%	71/92	

Notes:

1. There are different seasonal per-litre limits for the BEN — summer (1st number) and winter (2nd number).
2. Temporary average limits, which expire on December 31, 1999, take into account gasoline produced/imported before and after the expiry date for the temporary per-litre limits. After the expiry dates, regular limits apply.
3. "—" indicates that no temporary limit was applied for by the primary supplier.

Limites temporaires pour les fournisseurs principaux ayant choisi l'emploi d'une moyenne annuelle

Compagnie	Raffinerie ou province d'importation	Limites temporaires des moyennes annuelles (expiration — 31 décembre 1999)		Date d'expiration pour les plafonds temporaires à ne jamais dépasser
		<i>Benzène (% en vol.)</i> BEN	Plafonds temporaires à ne jamais dépasser <i>Benzène (% en vol.)</i> BEN	
Petro-Canada	Raffinerie de Montréal	1,28 % 76,4	4,61 % 156,8/198,1	15 novembre 1999
Shell	Raffinerie de Montréal	2,0 % 86,8	4,7 % 117,8/220,0	15 novembre 1999
Ultramar	Raffinerie de Québec et terminal de Montréal	1,2 % —	3,55 % —/134,8	15 novembre 1999
Pétroles Norcan	Importation au Québec	1,54 % 66,68	3,0 % —	15 novembre 1999
Petro-Canada	Raffinerie d'Oakville	1,75 % 80,4	4,29 % 140,6/—	15 septembre 1999
<i>Limites normatives en vertu des paragraphes 16(1) et 17(1)</i>				
Limites normatives	Benzène BEN	0,95 % 59,5	1,5 % 102/132	

Limites temporaires pour les fournisseurs principaux assujettis à des limites « simples »

Compagnie	Raffinerie ou province d'importation	Limite simple temporaire (par litre)		Date d'expiration de la limite simple temporaire
		<i>Benzène (% en vol.)</i>	<i>BEN</i>	
Olco/Neste	Importation au Québec et en Ontario	3,0 %	—	15 novembre 1999
Spur/Murphy	Importation en Ontario	2,06 %	—	15 septembre 1999
Parkland	Raffinerie de Bowden	1,5 %	—	31 décembre 1999
<i>Limites normatives en vertu du paragraphe 3(1) et de l'article 4</i>				
Limites normatives		1,0 %	71/92	

Remarques :

- Il y a différentes limites saisonnières par litre pour le BEN — été (1^{er} chiffre) et hiver (2^e chiffre).
- Les limites moyennes temporaires expirant le 31 décembre 1999 prennent en considération l'essence produite/importée avant et après la date d'expiration des limites par litre temporaires. Les limites habituelles s'appliquent après les dates d'expiration.
- « — » indique qu'aucune limite temporaire n'a été demandée par le fournisseur principal.

Under paragraph 3(2)(b) of the Regulations, the areas where gasoline sold is subject to temporary alternative limits are:

- Quebec, except that portion of the province that is in the northern supply area (as defined by the Regulations);
- all of Ontario; and
- southern Alberta and southeastern British Columbia (roughly the towns of Provost, Leduc, Drayton Valley and Revelstoke, and all other locations in Alberta and British Columbia south and east of those towns).

In the above areas, the prohibition on selling (as opposed to manufacturing, blending or importing) gasoline containing benzene at a concentration that exceeds 1.5 percent by volume is deferred from October 1, 1999, to April 1, 2000.

Alternative Limits for BEN under Subsection 17(2)

Under subsection 17(2) of the Regulations, primary suppliers may elect for alternative limits for the BEN based on the historical composition of their gasoline. There is no expiry date for alternative BEN limits.

In the Regulatory Impact Analysis Statement that accompanied the *Benzene in Gasoline Regulations*, published in the *Canada Gazette*, Part II, on November 26, 1997, the Minister of the Environment announced her intention that the alternative limits "will be publicly available and will be published by Environment Canada". Pursuant to that intention, the following alternative limits for the BEN have been applied for and approved:

Alternative Limits for BEN

Company	Refinery	Benzene Emissions Number	
		Alternative yearly pool average limit	Alternative never-to-be-exceeded cap (summer/winter)
Petro-Canada	Montréal	67.9	115.0/151.0
Shell	Montréal	65.3	110.5/144.7
Petro-Canada	Oakville	65.3	117.1/141.4
Shell	Sarnia	65.0	106.0/147.8
Standard limits under subsection 17(1)			
Standard limits		59.5	102/132

En vertu de l'alinéa 3(2)b) du Règlement, les zones où l'essence vendue est assujettie aux limites de remplacement temporaires sont :

- le Québec, sauf la partie de la province qui se situe dans la zone d'approvisionnement du nord (tel qu'il est défini dans le Règlement);
- l'Ontario en entier;
- le sud de l'Alberta et le sud-est de la Colombie-Britannique (aux environs des villages de Provost, Leduc, Drayton Valley et Revelstoke, et tous les endroits en Alberta et en Colombie-Britannique au sud et à l'est de ces villages).

Dans les endroits ci-dessus, l'interdiction de la vente (à l'opposé de la fabrication, du mélange ou de l'importation) de l'essence contenant du benzène à une concentration dépassant 1,5 p. 100 en volume est reportée du 1^{er} octobre 1999 au 1^{er} avril 2000.

Limites de remplacement pour le BEN en vertu du paragraphe 17(2)

En vertu du paragraphe 17(2) du Règlement, un fournisseur principal peut choisir d'être assujetti à des limites de remplacement pour le BEN en fonction de l'historique de la composition de son essence. Il n'y a pas de date d'expiration pour les limites de remplacement du BEN.

Dans le résumé de l'étude d'impact de la réglementation qui accompagne le *Règlement sur le benzène dans l'essence*, publié dans la Partie II de la *Gazette du Canada* le 26 novembre 1997, la ministre de l'Environnement a annoncé son intention que les limites de remplacement « seront rendues publiques et publiées par Environnement Canada. » Conformément à cette intention, les limites de remplacement pour le BEN qui suivent ont été demandées et approuvées :

Limites de remplacement du BEN

Compagnie	Raffinerie	Indice des émissions de benzène	
		Limite de remplacement de la moyenne annuelle	Plafond de remplacement à ne jamais dépasser (été/hiver)
Petro-Canada	Montréal	67,9	115,0/151,0
Shell	Montréal	65,3	110,5/144,7
Petro-Canada	Oakville	65,3	117,1/141,4
Shell	Sarnia	65,0	106,0/147,8
Limites normatives en vertu du paragraphe 17(1)			
Limites normatives		59,5	102/132

Contact

Bruce McEwen, Oil, Gas and Energy Branch, Air Pollution Prevention Directorate, Environment Canada, (819) 953-4673.

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Personne-ressource

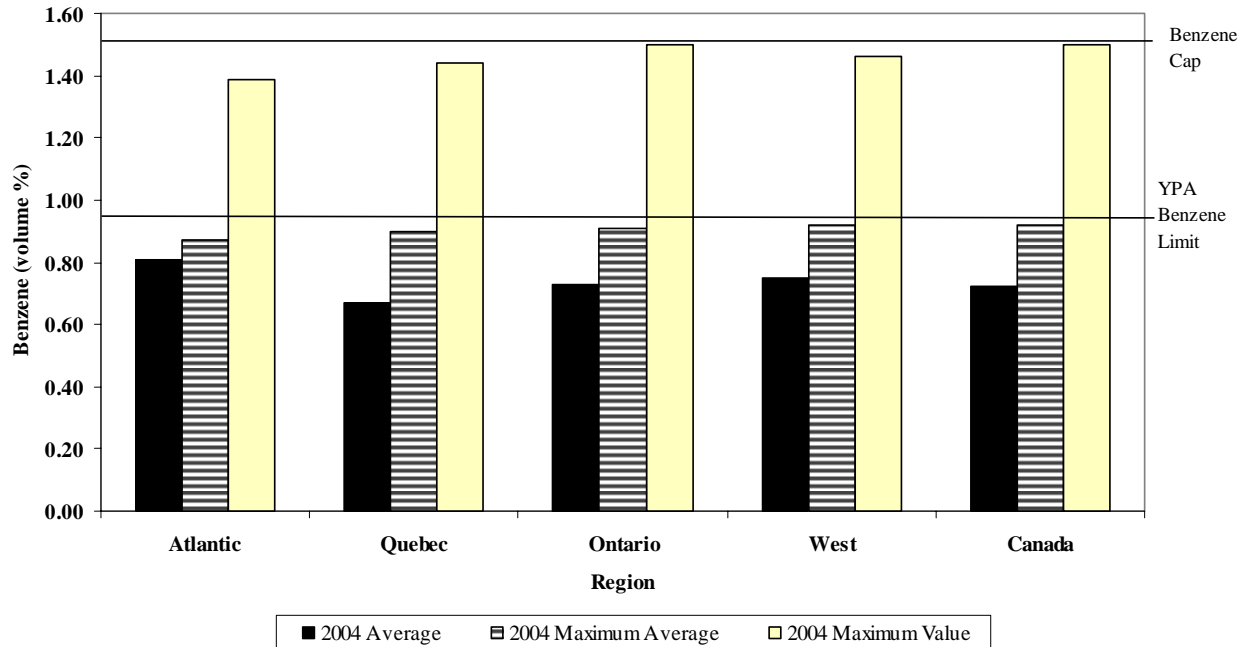
Bruce McEwen, Direction du pétrole, du gaz et de l'énergie, Direction générale de la prévention de la pollution atmosphérique, Environnement Canada, (819) 953-4673.

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Appendix 3

Regional and National Data for all
Parameters

Figure A3.1: Average, Maximum Average and Maximum Value for Benzene Concentration of Canadian Gasoline 2004

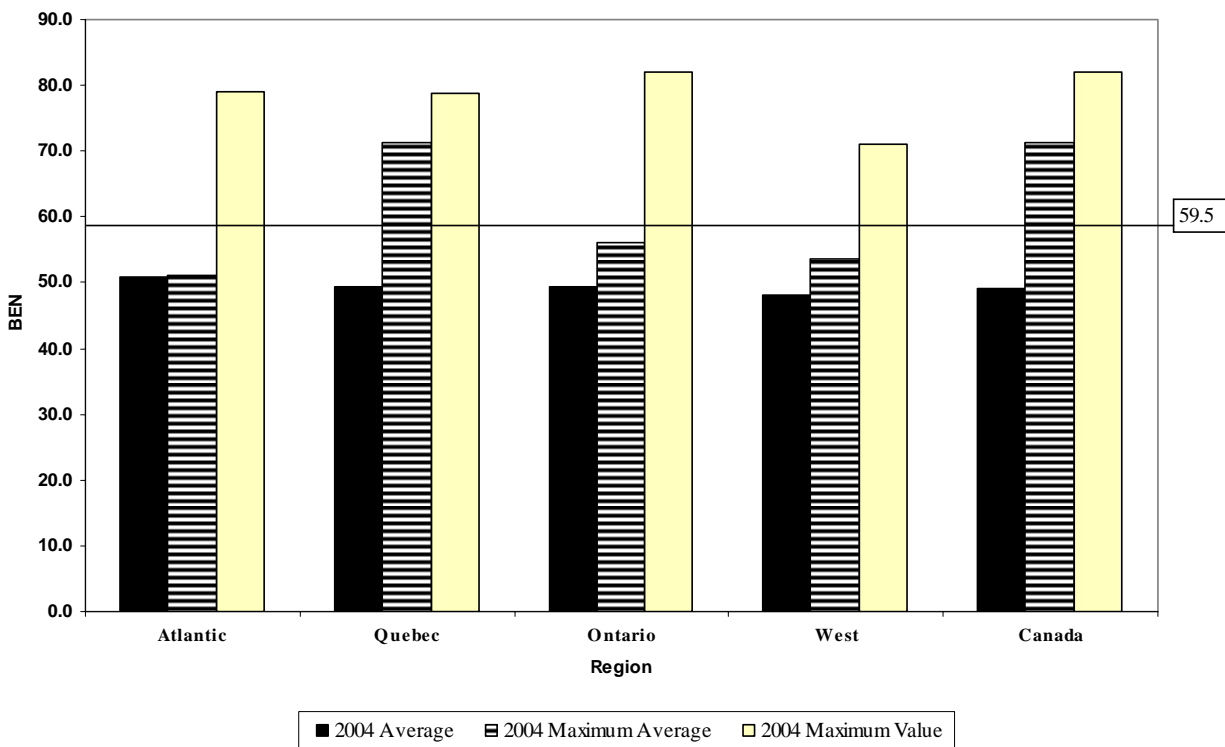


- The annual average Benzene limit for primary suppliers is 1.0% vol. or 0.95% vol. for those on a YPA.

Table A3.1: Average, Maximum Average, Maximum Value and Minimum Value for Benzene Concentration (% by volume)

Region	Volume (m ³)	Volume Weighted Average	Maximum Average	Maximum Value	Minimum Value
Atlantic	2,925,534	0.81	0.87	1.39	0.70
Quebec	10,710,179	0.67	0.90	1.44	0.61
Ontario	13,284,470	0.73	0.91	1.50	0.32
West	13,602,771	0.75	0.92	1.46	0.32
Canada	40,522,954	0.72	0.92	1.50	0.32

Figure A3.2: Average, Maximum Average and Maximum Value for BEN of Canadian Gasoline 2004



- The annual average BEN limit for primary suppliers on a YPA is 59.5.

Table A3.2: Average, Maximum Average, Maximum Value and Minimum Value for BEN

Region	Volume (m ³)	Volume Weighted Average	Maximum Average	Maximum Value	Minimum Value
Atlantic	2,925,534	50.7	51.0	79.0	44.1
Quebec	10,710,179	49.4	71.4	78.8	47.2
Ontario	13,284,470	49.4	56.0	81.9	36.9
West	13,602,771	48.2	53.7	71.0	38.4
Canada	40,522,954	49.1	71.4	81.9	36.9

Figure A3.3: Average, Maximum Average and Maximum Value for Sulphur Concentration of Canadian Gasoline 2004

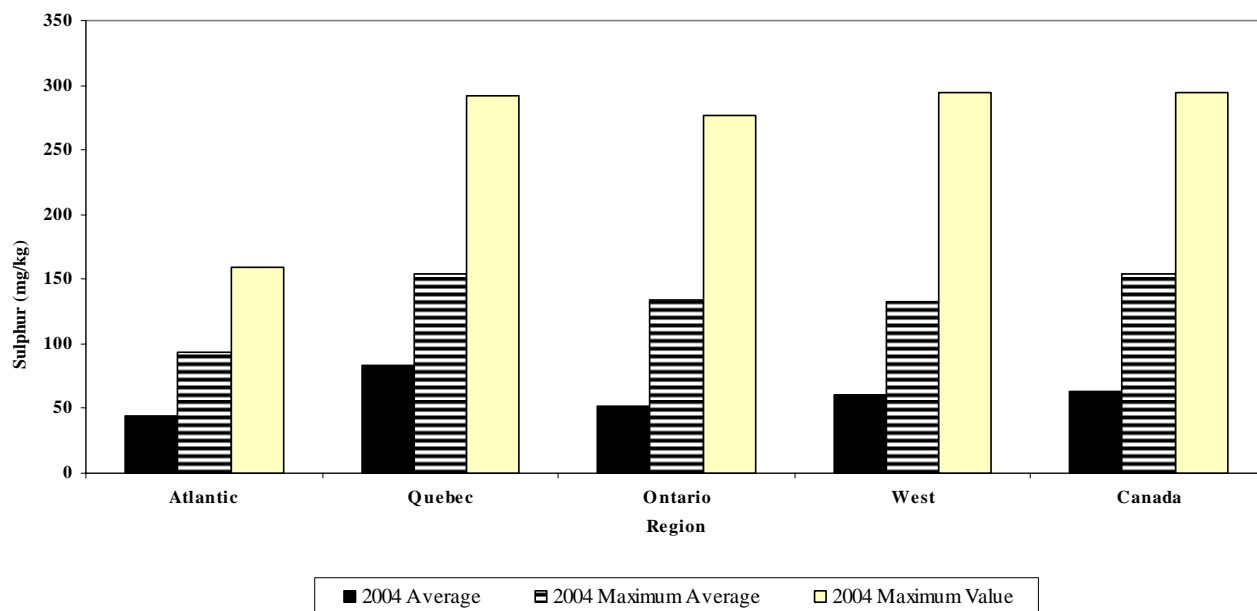


Table A3.3: Average, Maximum Average, Maximum Value and Minimum Value for Sulphur Concentration (mg/kg)

Region	Volume (m ³)	Volume Weighted Average	Maximum Average	Maximum Value	Minimum Value
Atlantic	2,925,534	44	93.5	159	25
Quebec	10,710,179	83	154.0	292	16
Ontario	13,284,470	52	134.0	277	15
West	13,602,771	61	133.0	295	8
Canada	40,522,954	63	154.0	295	8

Figure A3.4: Average, Maximum Average and Maximum Value for Olefin Concentration of Canadian Gasoline 2004

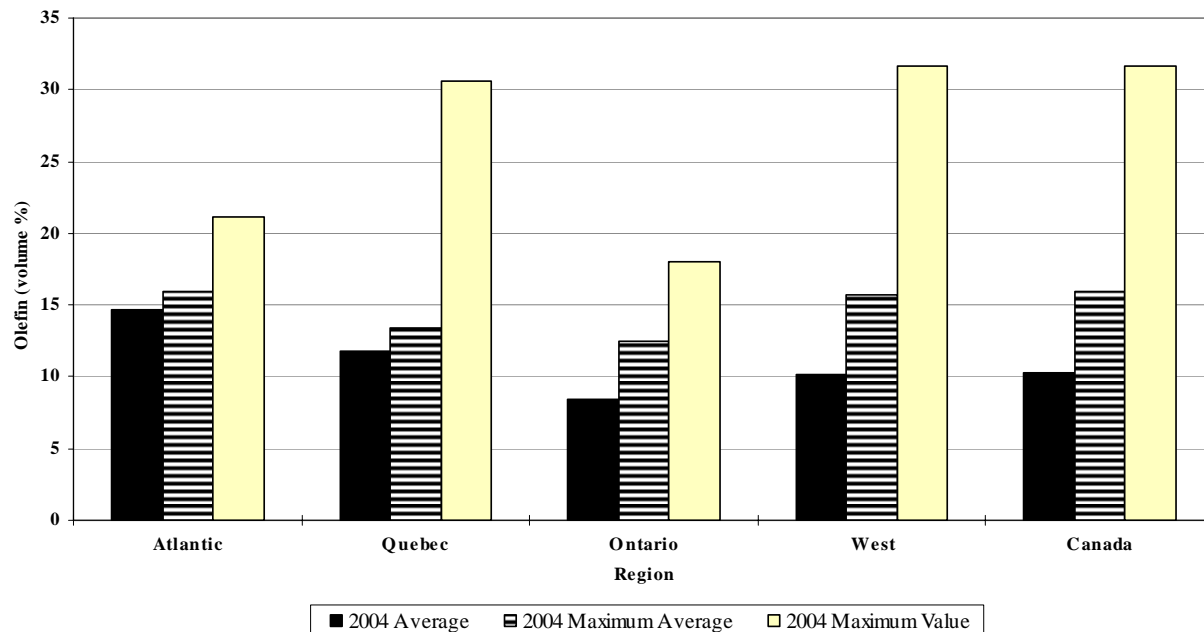


Table A3.4: Average, Maximum Average, Maximum Value and Minimum Value for Olefin Concentration (% by volume)

Region	Volume (m ³)	Volume Weighted Average	Maximum Average	Maximum Value	Minimum Value
Atlantic	2,925,534	14.7	15.9	21.1	2.7
Quebec	10,710,179	11.8	13.4	30.6	7.7
Ontario	13,284,470	8.4	12.5	18.0	1.5
West	13,602,771	10.1	15.7	31.7	0.9
Canada	40,522,954	10.3	15.9	31.7	0.9

Figure A3.5: Average, Maximum Average and Maximum Value for Aromatics Concentration of Canadian Gasoline 2004

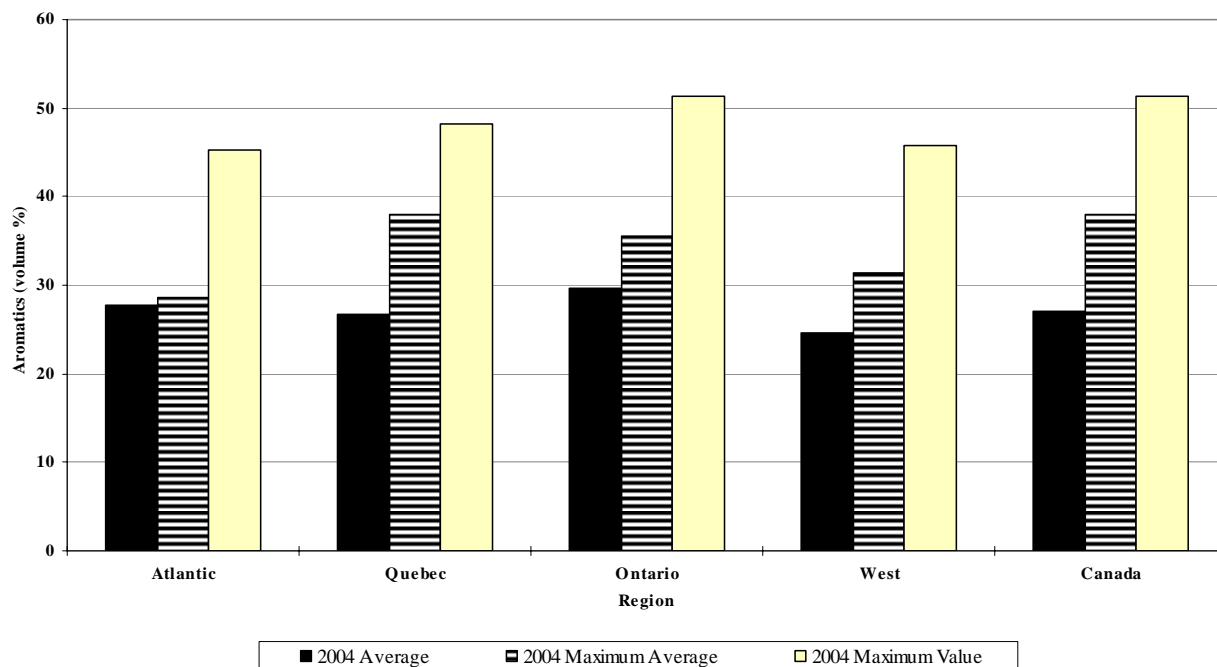


Table A3.5: Average, Maximum Average, Maximum Value and Minimum Value for Aromatics Concentration (% by volume)

Region	Volume (m ³)	Volume Weighted Average	Maximum Average	Maximum Value	Minimum Value
Atlantic	2,925,534	27.8	28.7	45.2	23.1
Quebec	10,710,179	26.8	38.0	48.2	21.6
Ontario	13,284,470	29.6	35.5	51.4	25.0
West	13,602,771	24.6	31.4	45.7	20.5
Canada	40,522,954	27.0	38.0	51.4	20.5

Figure A3.6: Average, Maximum Average and Maximum Value for Average E200 of Canadian Gasoline 2004

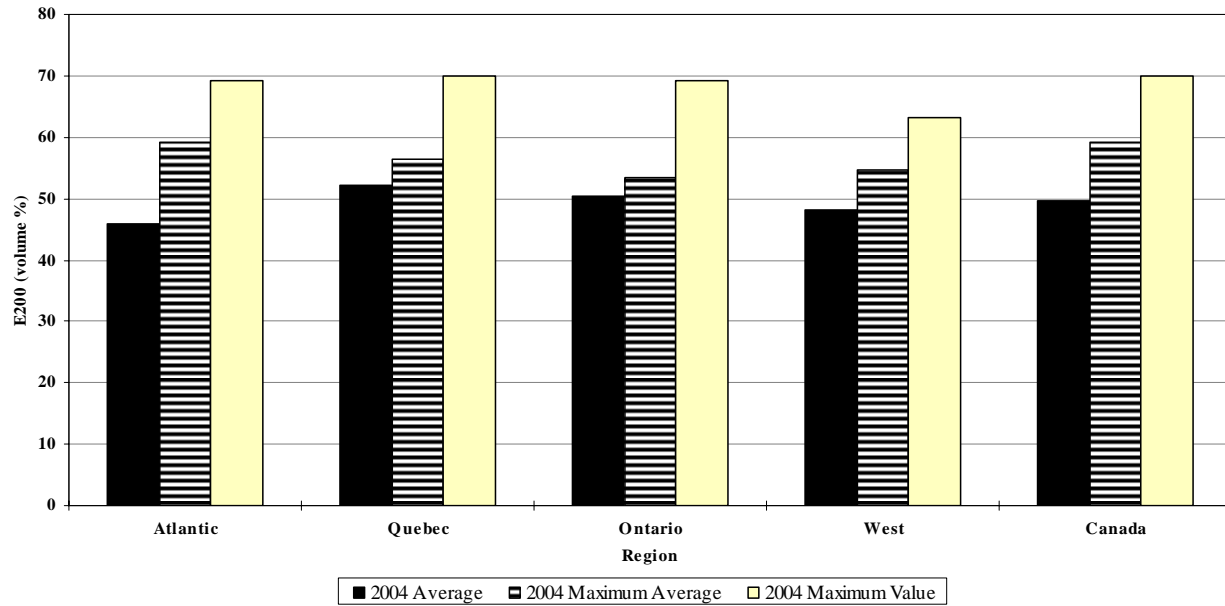


Table A3.6: Average, Maximum Average, Maximum Value and Minimum Value for E200 (% by volume)

Region	Volume (m ³)	Volume Weighted Average	Maximum Average	Maximum Value	Minimum Value
Atlantic	2,925,534	45.9	59.3	69.1	43.5
Quebec	10,710,179	52.1	56.5	69.9	44.0
Ontario	13,284,470	50.4	53.5	69.3	48.8
West	13,602,771	48.1	54.6	63.1	45.8
Canada	40,522,954	49.7	59.3	69.9	43.5

Figure A3.7: Average, Maximum Average and Maximum Value for E300 of Canadian Gasoline 2004

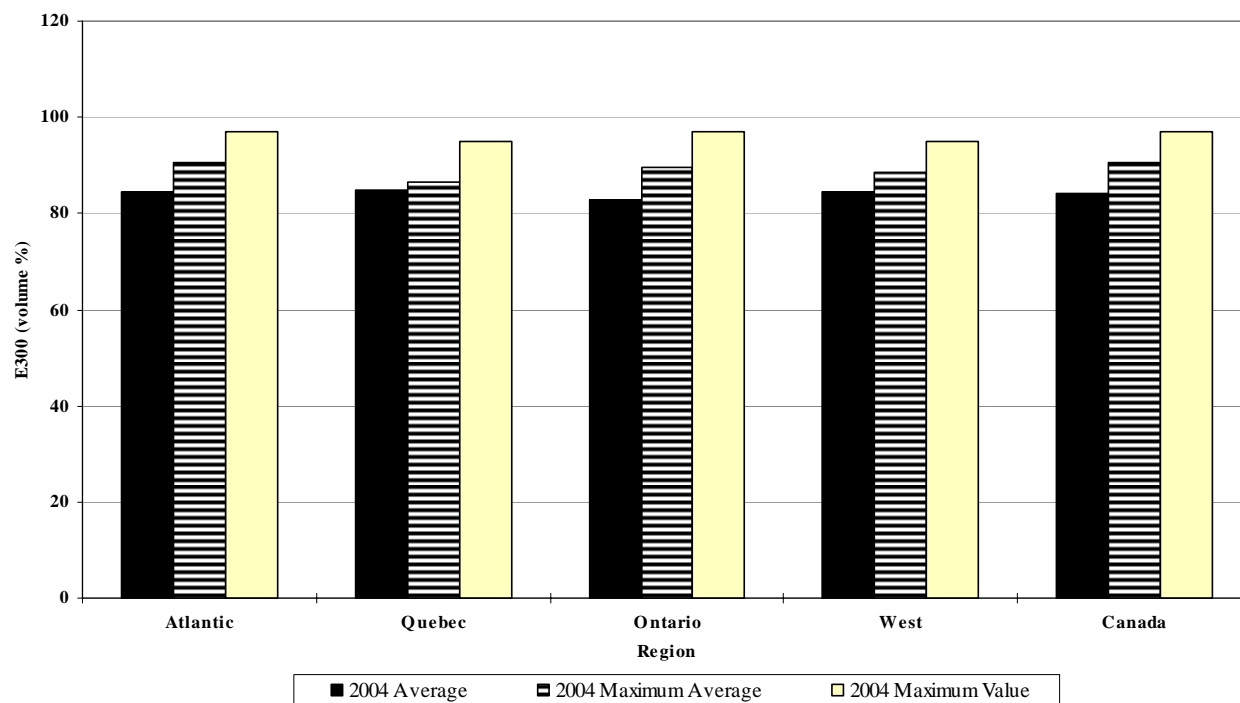
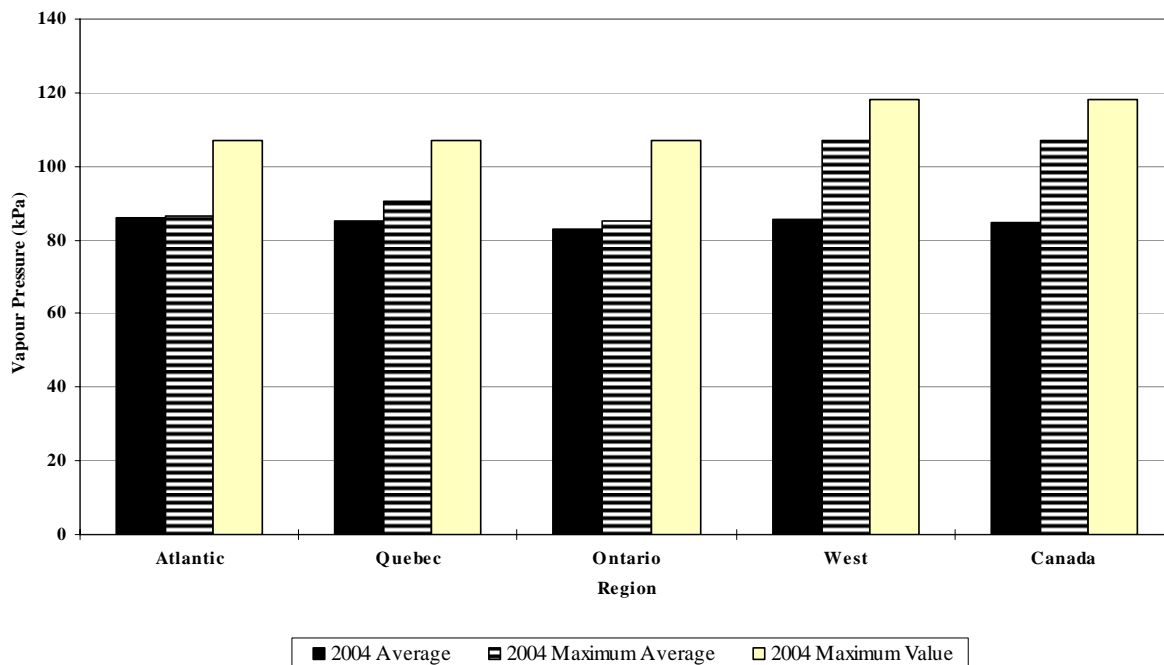


Table A3.7: Average, Maximum Average, Maximum Value and Minimum Value for E300 (% by volume)

Region	Volume (m ³)	Volume Weighted Average	Maximum Average	Maximum Value	Minimum Value
Atlantic	2,925,534	84.6	90.5	96.9	82.6
Quebec	10,710,179	84.7	86.4	94.9	82.7
Ontario	13,284,470	82.9	89.7	97.0	69.8
West	13,602,771	84.7	88.4	95.0	79.4
Canada	40,522,954	84.1	90.5	97.0	69.8

Figure A3.8: Average, Maximum Average and Maximum Value for Vapour Pressure of Canadian Gasoline 2004



1 psi = 6.894757 kPa

Table A3.8: Average, Maximum Average, Maximum Value and Minimum Value for Vapour Pressure (kPa)

Region	Volume (m ³)	Volume Weighted Average	Maximum Average	Maximum Value	Minimum Value
Atlantic	2,925,534	86.0	86.7	106.9	71.2
Quebec	10,710,179	85.3	90.3	107.0	55.0
Ontario	13,284,470	82.7	85.2	107.2	79.0
West	13,602,771	85.6	107.2	118.0	53.4
Canada	40,522,954	84.6	107.2	118.0	53.4

Figure A3.9: Average, Maximum Average and Maximum Value for Oxygen Concentration of Canadian Gasoline Based on All Volumes of Gasoline 2004

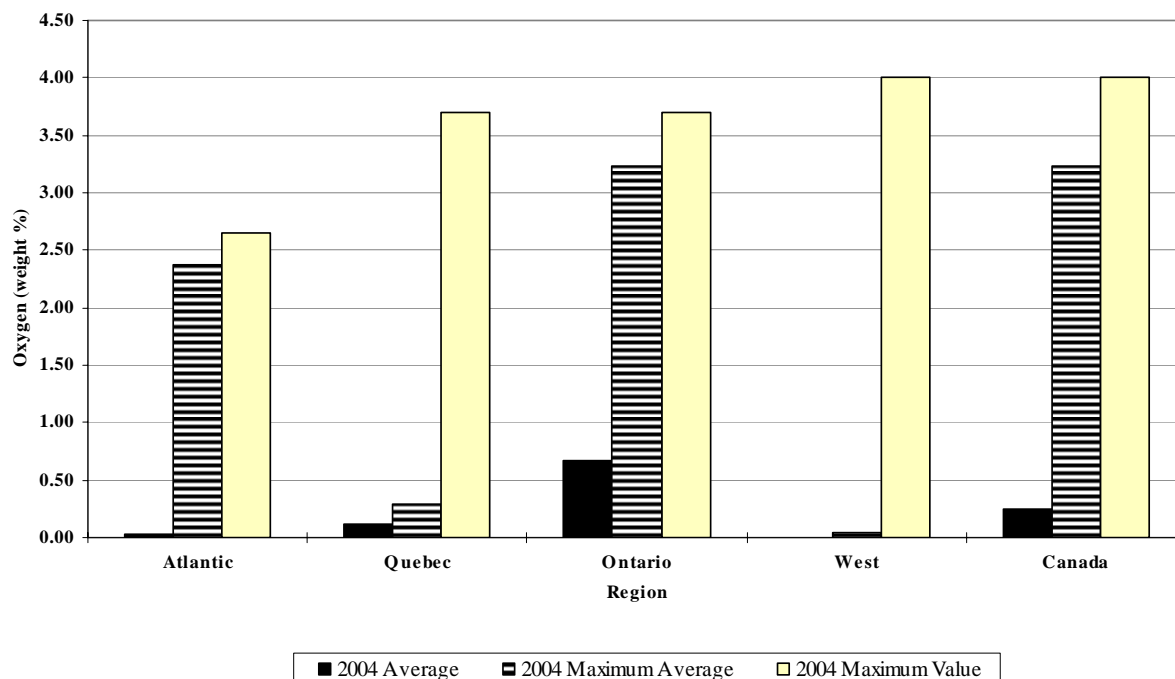


Table A3.9: Average, Maximum Average and Maximum Value for Oxygen Concentration Based on All Volumes of Gasoline (% by weight)

	Volume (m ³)	Volume Weighted Average	Maximum Average	Maximum Value
Atlantic	2,925,534	0.03	2.37	2.7
Quebec	10,710,179	0.12	0.29	3.7
Ontario	13,284,470	0.67	3.24	3.7
West	13,602,771	0.00	0.04	4.0
Canada	40,522,954	0.28	3.24	4.0

Note:

The regulations do not require reporting of oxygenate blended downstream of the refinery (except for a few special incidences described in the regulations). These values are therefore likely to be underestimates of oxygenate usage.

Appendix 4

Company Reported Data

Table A4.1: Averages and Maxima Reported for Benzene (% by volume)

	Company	Average	Maximum
Refiners	Chevron - Burnaby Refinery	0.50	1.40
	Consumers' Co-operative Refineries Limited	0.80	1.46
	Husky - Prince George Refinery	0.92	1.11
	IOL Dartmouth Refinery	0.87	1.34
	IOL Nanticoke Refinery	0.91	1.50
	IOL Sarnia Refinery	0.61	1.05
	IOL Strathcona Refinery	0.89	1.22
	Irving Oil Refinery	0.72	1.39
	North Atlantic Refining Ltd.	0.86	1.00
	Petro-Canada Edmonton Refinery	0.81	1.25
	Petro-Canada-Montreal	0.62	1.44
	Petro-Canada-Oakville Refinery	0.83	1.34
	Shell Montreal Refinery	0.61	1.24
	Shell Sarnia Refinery	0.69	1.03
	Shell Scotford Refinery	0.43	0.89
	Suncor Energy Products Inc.	0.45	1.19
Ultramar Refinery St. Romuald	0.73	1.21	
Blenders	Robbins Feed and Fuel Ltd Blending Facility	0.76	0.95
	Shell Sherwood Marketing Terminal	0.32	0.32
Importers	General Motors of Canada Limited	0.32	0.60
	IOL - Burrard Terminal	0.60	0.93
	Petro-Canada- Burrard Products Terminal	0.75	1.20
	Petroles Norcan Inc.	0.74	0.88
	Suncor - Quebec	0.90	0.90
	Ultramar - Holyrood Terminal	0.70	0.86

Table A4.2: Averages and Maxima Reported for BEN

	Company	Average	Maximum
Refiners	Chevron - Burnaby Refinery	45.9	65.2
	Consumers' Co-operative Refineries Limited	48.0	70.3
	Husky - Prince George Refinery	47.8	69.8
	IOL Dartmouth Refinery	51.0	79.0
	IOL Nanticoke Refinery	53.0	74.0
	IOL Sarnia Refinery	56.0	70.0
	IOL Strathcona Refinery	50.0	66.0
	Irving Oil Refinery	50.9	71.2
	North Atlantic Refining Ltd.	44.1	52.9
	Petro-Canada Edmonton Refinery	48.4	61.5
	Petro-Canada-Montreal*	49.2	75.9
	Petro-Canada-Oakville Refinery*	51.9	57.4
	Shell Montreal Refinery*	51.7	70.8
	Shell Sarnia Refinery*	51.4	81.9
	Shell Scotford Refinery	47.1	71.0
Suncor Energy Products Inc.	36.9	64.4	
Ultramar Refinery St. Romuald	47.2	78.8	
Blenders	Robbins Feed and Fuel Ltd Blending Facility	42.1	49.6
	Shell Sherwood Marketing Terminal	53.7	53.7
Importers	General Motors of Canada Limited	43.9	65.9
	IOL - Burrard Terminal	38.4	42.6
	Petro-Canada- Burrard Products Terminal	43.7	60.8
	Petroles Norcan Inc.	54.2	69.0
	Suncor - Quebec	71.4	71.4
	Ultramar - Holyrood Terminal	45.3	53.7

Note:

Primary suppliers that are shaded and marked with an asterisk have an alternative limit for the BEN.

See Appendix 2 for details.

Table A4.3: Averages and Maxima Reported for Aromatics (% by volume)

	Company	Average	Maximum
Refiners	Chevron - Burnaby Refinery	23.9	36.1
	Consumers' Co-operative Refineries Limited	25.8	34.8
	Husky - Prince George Refinery	20.5	43.3
	IOL Dartmouth Refinery	27.5	45.2
	IOL Nanticoke Refinery	31.1	43.7
	IOL Sarnia Refinery	35.5	44.3
	IOL Strathcona Refinery	24.6	35.0
	Irving Oil Refinery	28.7	36.3
	North Atlantic Refining Ltd.	25.3	28.5
	Petro-Canada Edmonton Refinery	21.1	31.0
	Petro-Canada-Montreal	29.2	47.8
	Petro-Canada-Oakville Refinery	27.1	45.1
	Shell Montreal Refinery	31.5	48.2
	Shell Sarnia Refinery	31.0	51.4
	Shell Scotford Refinery	31.3	45.7
	Suncor Energy Products Inc.	25.0	50.0
Ultramar Refinery St. Romuald	21.6	40.8	
Blenders	Robbins Feed and Fuel Ltd Blending Facility	28.5	40.2
	Shell Sherwood Marketing Terminal	29.9	29.9
Importers	General Motors of Canada Limited	31.8	35.4
	IOL - Burrard Terminal	25.9	36.9
	Petro-Canada- Burrard Products Terminal	31.4	42.3
	Petroles Norcan Inc.	28.9	38.0
	Suncor - Quebec	38.0	38.0
	Ultramar - Holyrood Terminal	23.1	28.8

Table A4.4: Averages and Maxima Reported for Olefins (% by volume)

	Company	Average	Maximum
Refiners	Chevron - Burnaby Refinery	11.5	31.7
	Consumers' Co-operative Refineries Limited	14.2	18.3
	Husky - Prince George Refinery	15.7	21.9
	IOL Dartmouth Refinery	15.9	21.1
	IOL Nanticoke Refinery	10.5	16.6
	IOL Sarnia Refinery	1.50	4.30
	IOL Strathcona Refinery	11.3	19.5
	Irving Oil Refinery	12.9	20.9
	North Atlantic Refining Ltd.	2.70	10.0
	Petro-Canada Edmonton Refinery	10.2	31.6
	Petro-Canada-Montreal	11.2	30.6
	Petro-Canada-Oakville Refinery	10.4	18.0
	Shell Montreal Refinery	9.90	22.3
	Shell Sarnia Refinery	12.5	16.3
	Shell Scotford Refinery	1.70	5.70
	Suncor Energy Products Inc.	4.00	15.4
Ultramar Refinery St. Romuald	13.4	20.8	
Blenders	Robbins Feed and Fuel Ltd Blending Facility	8.80	11.3
	Shell Sherwood Marketing Terminal	0.90	0.90
Importers	General Motors of Canada Limited	1.92	3.30
	IOL - Burrard Terminal	6.60	12.4
	Petro-Canada- Burrard Products Terminal	14.6	23.8
	Petroles Norcan Inc.	12.6	22.5
	Suncor - Quebec	7.70	7.70
	Ultramar - Holyrood Terminal	14.6	20.3

Table A4.5: Averages and Maxima Reported for Sulphur (mg/kg)

	Company	Average	Maximum
Refiners	Chevron - Burnaby Refinery	133	295
	Consumers' Co-operative Refineries Limited	72	217
	Husky - Prince George Refinery	98	180
	IOL Dartmouth Refinery	28	98
	IOL Nanticoke Refinery	21	63
	IOL Sarnia Refinery	15	77
	IOL Strathcona Refinery	30	83
	Irving Oil Refinery	65	141
	North Atlantic Refining Ltd.	25	60
	Petro-Canada Edmonton Refinery	81	260
	Petro-Canada-Montreal	29	107
	Petro-Canada-Oakville Refinery	134	271
	Shell Canada Products	34	292
	Shell Sarnia Refinery	58	115
	Shell Scotford Refinery	10	36
	Suncor Energy Products Inc.	46	277
Ultramar Refinery St. Romuald	154	285	
Blenders	Robbins Feed and Fuel Ltd Blending Facility	104	149
	Shell Sherwood Marketing Terminal	8	8
Importers	General Motors of Canada Limited	16	27
	IOL - Burrard Terminal	75	114
	Petro-Canada- Burrard Products Terminal	114	235
	Petroles Norcan Inc.	79	165
	Suncor - Quebec	16	16
	Ultramar - Holyrood Terminal	94	159

Table A4.6: Averages and Maxima Reported for Oxygen (% by weight)

	Company	Oxygenate	Average	Maximum
Refiners	Chevron - Burnaby Refinery	N/A	0.00	0.00
	Consumers' Co-operative Refineries Limited	N/A	0.00	0.00
	Husky - Prince George Refinery	Ethanol	0.04	4.00
	IOL Dartmouth Refinery	N/A	0.00	0.00
	IOL Nanticoke Refinery	N/A	0.00	0.00
	IOL Sarnia Refinery	N/A	0.00	0.00
	IOL Strathcona Refinery	N/A	0.00	0.00
	Irving Oil Refinery	MTBE	0.01	0.18
	North Atlantic Refining Ltd.	MTBE	2.37	2.65
	Petro-Canada Edmonton Refinery	MTBE	0.00	0.20
	Petro-Canada-Montreal	Ethanol	0.29	3.70
	Petro-Canada-Oakville Refinery	N/A	0.00	0.00
	Shell Montreal Refinery	MTBE, ETBE, Ethanol	0.10	0.60
	Shell Sarnia Refinery	MTBE	0.00	0.50
	Shell Scotford Refinery	N/A	0.00	0.00
	Suncor Energy Products Inc.	Ethanol	3.10	3.70
Ultramar Refinery St. Romuald	N/A	0.00	0.00	
Blenders	Robbins Feed and Fuel Ltd Blending Facility	Ethanol	3.24	3.60
	Shell Sherwood Marketing Terminal	N/A	0.00	0.00
Importers	General Motors of Canada Limited	N/A	0.00	0.00
	IOL - Burrard Terminal	N/A	0.00	0.00
	Petro-Canada- Burrard Products Terminal	MTBE	0.00	0.01
	Petroles Norcan Inc.	MTBE	0.28	1.67
	Suncor - Quebec	MTBE	0.10	0.10
	Ultramar - Holyrood Terminal	N/A	0.73	1.54

Table A4.7: Averages and Maxima Reported for Vapour Pressure (kPa)

	Company	Average	Maximum
Refiners	Chevron - Burnaby Refinery	82.0	108
	Consumers' Co-operative Refineries Limited	87.4	106
	Husky - Prince George Refinery	85.0	109
	IOL Dartmouth Refinery	86.7	107
	IOL Nanticoke Refinery	84.0	107
	IOL Sarnia Refinery	82.8	106
	IOL Strathcona Refinery	87.2	112
	Irving Oil Refinery	86.3	106
	North Atlantic Refining Ltd.	82.0	103
	Petro-Canada Edmonton Refinery	87.0	118
	Petro-Canada-Montreal	84.7	107
	Petro-Canada-Oakville Refinery	82.6	107
	Shell Montreal Refinery	81.2	107
	Shell Sarnia Refinery	85.2	107
	Shell Scotford Refinery	88.0	107
	Suncor Energy Products Inc.	79.0	107
Ultramar Refinery St. Romuald	90.3	107	
Blenders	Robbins Feed and Fuel Ltd Blending Facility	80.4	106
	Shell Sherwood Marketing Terminal	107	107
Importers	General Motors of Canada Limited	83.8	98.9
	IOL - Burrard Terminal	53.4	58.7
	Petro-Canada- Burrard Products Terminal	53.6	56.6
	Petroles Norcan Inc.	70.9	90.3
	Suncor - Quebec	55.0	55.0
	Ultramar - Holyrood Terminal	71.2	83.7

Table A4.8: Averages and Maxima Reported for E200 (% by volume)

	Company	Average	Maximum
Refiners	Chevron - Burnaby Refinery	48.3	63.1
	Consumers' Co-operative Refineries Limited	45.8	54.2
	Husky - Prince George Refinery	49.0	62.0
	IOL Dartmouth Refinery	46.9	62.7
	IOL Nanticoke Refinery	50.1	63.9
	IOL Sarnia Refinery	51.4	59.7
	IOL Strathcona Refinery	46.0	59.6
	Irving Oil Refinery	43.5	52.6
	North Atlantic Refining Ltd.	59.3	69.1
	Petro-Canada Edmonton Refinery	50.5	60.7
	Petro-Canada-Montreal	50.1	69.9
	Petro-Canada-Oakville Refinery	49.7	59.9
	Shell Montreal Refinery	47.2	60.2
	Shell Sarnia Refinery	48.8	59.5
	Shell Scotford Refinery	49.6	59.8
	Suncor Energy Products Inc.	52.0	65.0
Ultramar Refinery St. Romuald	56.5	67.8	
Blenders	Robbins Feed and Fuel Ltd Blending Facility	53.5	59.2
	Shell Sherwood Marketing Terminal	54.6	54.6
Importers	General Motors of Canada Limited	53.5	69.3
	IOL - Burrard Terminal	49.9	62.7
	Petro-Canada- Burrard Products Terminal	46.4	51.6
	Petroles Norcan Inc.	54.2	61.0
	Suncor - Quebec	44.0	44.0
	Ultramar - Holyrood Terminal	52.8	59.5

Table A4.9: Averages and Maxima Reported for E300 (% by volume)

	Company	Average	Maximum
Refiners	Chevron - Burnaby Refinery	85.9	95.0
	Consumers' Co-operative Refineries Limited	79.4	82.9
	Husky - Prince George Refinery	86.0	92.0
	IOL Dartmouth Refinery	85.6	92.4
	IOL Nanticoke Refinery	79.9	94.2
	IOL Sarnia Refinery	89.7	95.6
	IOL Strathcona Refinery	84.1	94.0
	Irving Oil Refinery	82.6	90.2
	North Atlantic Refining Ltd.	88.2	91.0
	Petro-Canada Edmonton Refinery	88.4	93.5
	Petro-Canada-Montreal	82.7	94.9
	Petro-Canada-Oakville Refinery	86.9	97.0
	Shell Montreal Refinery	84.8	93.6
	Shell Sarnia Refinery	81.2	90.3
	Shell Scotford Refinery	81.5	90.8
	Suncor Energy Products Inc.	82.0	95.0
Ultramar Refinery St. Romuald	85.9	92.9	
Blenders	Robbins Feed and Fuel Ltd Blending Facility	83.3	89.9
	Shell Sherwood Marketing Terminal	86.1	86.1
Importers	General Motors of Canada Limited	69.8	88.0
	IOL - Burrard Terminal	88.4	94.0
	Petro-Canada- Burrard Products Terminal	82.7	87.5
	Petroles Norcan Inc.	86.4	93.8
	Suncor - Quebec	85.0	85.0
	Ultramar - Holyrood Terminal	90.5	96.9