



Environment
Canada

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Canadian Fuel Quality Parameters

**Fuel Standards Workshop
International Best Practices and
Regulation in Mexico
Mexico City, Mexico
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August 11 and 12, 2015**

Regulatory Action in Canada

- Environmental issues are a shared jurisdiction between provincial and federal authorities, stemming from the Canadian Constitution
 - Fuels are regulated by the provinces and by the federal government and both entities may regulate the same parameter (e.g. renewable fuels)
 - Both regulatory schemes must be complied with
- Federal regulations for fuels relate to issues with environmental and/or health concerns, including:
 - Sulphur levels (gasoline, diesel)
 - Benzene (gasoline)
 - Lead (gasoline)
- The Canadian General Standards Board (CGSB) develops national voluntary fuel standards which can be adopted into provincial regulations
 - Focus on operability and the fuels fitness for a particular use

Environmental Performance versus Operability

Environmental Performance

- The scope of Environment Canada's regulatory work on fuel quality parameters is very specific and is limited to reducing exposure to toxic substances or controlling air pollution if the Governor in Council is of the opinion that a regulation could make a significant contribution to the prevention of, or reduction in, air pollution (CEPA 1999)
 - The fuel and its components or the fuel's effect on the operations and performance of emissions control technology are considered
- Examples of regulated parameters that fit this requirement include: sulphur, benzene and lead

Operability

- The Canadian General Standards Board (CGSB) coordinates industry committees to address technical issues related to fuel parameters and develops standards based on them.
- These generally affect commercial suitability and the fuels suitability for a particular use.
- Examples of operability parameters are gasoline corrosion, water tolerance, contaminants, etc.



Regulations versus Standards

Environment Canada's eight fuel quality regulations are:

- Benzene in Gasoline Regulations;
- Contaminated Fuels Regulations;
- Fuel Information Regulations, No. 1;
- Gasoline Regulations;
- Sulphur in Diesel Fuel Regulations;
- Sulphur in Gasoline Regulations;
- Regulations Prescribing Circumstances for Granting Waivers Pursuant to Section 147 of the Act; and,
- Renewable Fuels Regulations

CGSB's fuel quality standards include:

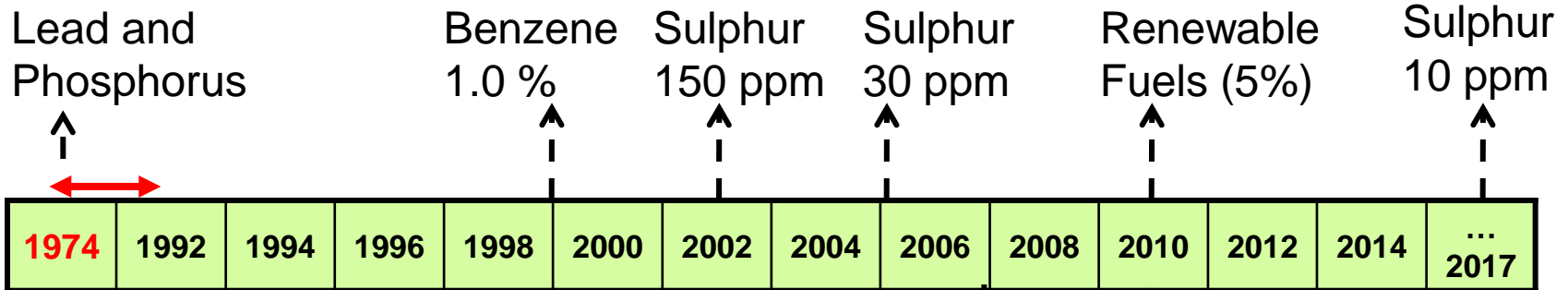
- Automotive Gasoline and Oxygenated Unleaded Gasoline Containing Ethanol: sets standards for sulphur, lead, deposit control additives, octane number (antiknock index), vapour pressure, driveability index, benzene
- Diesel Fuel and Automotive Diesel Fuel Containing Low Levels of Biodiesel (B1-B5): sets standards for sulphur, cetane number, lubricity, electrical conductivity, flash point, viscosity



Federal Fuels Regulatory History (Canada)*

*Effective dates

Gasoline



Diesel (sulphur)

- On-road: 500 ppm (1998), 15 ppm (2006)
- Off-road: 500 ppm (2006), 15 ppm (2010)
- Rail and Marine (small): 500 ppm (2006), 15 ppm (2010)
- Large Marine: Renewable Fuels (2%) (2010), 0.1% (2017)



Sulphur in Diesel Fuel Regulations (2002)

- Limits sulphur in diesel fuel for various uses phased in from 2006 to 2014
 - Bio-based diesel included
- Annual reporting of gasoline volumes and sulphur contents

SULPHUR IN DIESEL FUEL REGULATIONS			
DIESEL FUEL FOR USE IN:	REGULATED ACTIVITY	SULPHUR LIMIT (mg/kg)	EFFECTIVE DATE
Large Vessels (Marine Diesel)	Production, import or sales (para. 3(1)(e))	1000	June 1, 2014
Large Stationary Engines	Production, import or sales (para. 3(1)(g))	1000	June 1, 2014
Non-large Vessels	Production or import (para. 3(1)(b))	15	June 1, 2012
	Sales (para. 3(1)(d))	500	October 1, 2007
		15	June 1, 2014
Small Stationary Engines	Production, import or sales (para. 3(1)(f))	15	June 1, 2014
Rail (locomotive)	Production or import (para. 3(1)(b))	15	June 1, 2012
	Sales (para. 3(1)(c))	500	October 1, 2007
Off-road Engines	Production, import or sales (para. 3(1)(a))	15	Since 2010
On-road Vehicles	Production, import or sales (para. 3(1)(a))	15	Since 2006



Sulphur in Gasoline Regulations

- Limits for sulphur in gasoline phased in starting in 2002
- On July 29, 2015, Canada amended the regulations to reduce sulphur further to 10 ppm average in alignment with U.S. EPA Tier III Rules

	DEFAULT		ELECTION OPTION	
	PER BATCH LIMIT		POOL AVERAGE (ANNUAL)	
	Production / Import (para 2(1)(b))	Sales Cap (ss 2(3))	Production / Import (para 2(2)(b) and para 2(1)(a))	Sales Cap (ss 2(3))
Sulphur Limits	Current: 40 mg/kg 2017 to 2019: 14 mg/kg 2020 onwards: 12 mg/kg	80 mg/kg	Current: 30 mg/kg 2017 onwards: 10 mg/kg Never to be exceeded cap of: 80 mg/kg	80 mg/kg



Oxygenates

- Oxygenates are reported under the *Benzene in Gasoline Regulations* for gasoline produced and imported as part of the Benzene Emissions Number (BEN) calculation – this however would under represent the oxygenates added downstream at a terminals (such as ethanol).
- Oxygenates reported under the *Benzene in Gasoline Regulations* include Methyl tertiary-butyl ether (MTBE) and Ethanol
- Ethanol is the main oxygenate used in Canada and is used to comply with the *Renewable Fuels Regulations*
 - The regulations require an annual average of 5% renewable fuel content in gasoline produced and imported, which is currently being met with
 - Generally blended at 10% ethanol by volume, limited blends of E85
- Canadian producers have phased out the use of MTBE due to concerns with groundwater contamination (very small quantities are reported in imported volumes)

Octane

- There are no federal requirements for octane; some provinces set requirements by incorporating CGSB standards in their regulations
- CGSB sets minimum standards for the Antiknock Performance of automotive gasoline, using Antiknock Index (AKI) to differentiate grades of gasoline and sets a minimum Motor Octane Number for the lowest grade of gasoline of 82.0
 - AKI is the average of 2 octane numbers – the research octane number and the motor octane number: $(RON + MON) / 2$
- Retail gasoline pumps are labelled with minimum AKI
 - regular grade 87.0; mid-grade 89.0; premium grade 91.0 and super-premium grade 93.0
- Ethanol also increases octane in gasoline
 - Data suggests that prior to blending with ethanol, Canadian gasoline already meets the minimum AKI requirements of 87.0
- Most refiners produce 87.0 and 91.0 AKI; 89.0 AKI gasoline is achieved by blending the two at a retail station

On-Road Diesel Fuel – Lubricity and Cetane

- There are no federal requirements for lubricity and cetane; some provinces set requirements by incorporating CGSB standards in their regulations
- The lubricity requirement in the CGSB standards requires a lubricity additive to be incorporated that provides acceptable performance
 - pump wear of 4.0 or less determined according to the specified SAE papers, or
 - achieving a maximum wear scar diameter of less than or equal to 460 μm at 60°C using the High Frequency Reciprocating Rig test described in ASTM D6079 and D7688
- The CGSB standard for on-road diesel fuel sets a minimum standard for cetane number of 40
 - CGSB cautions that a higher cetane number for on-road diesel may be necessary for some engines and that conditions of operation may also dictate the specification of a higher cetane number
- The CGSB standards for other diesel fuel uses, such as locomotive and marine set different requirements for cetane number

Reid Vapour Pressure (RVP)

- There are no federal requirements for RVP; some provinces set specific RVP requirements for regions in their province and/or incorporate CGSB standards in their regulations
- Vapour pressure is a parameter that is reported to EC under the Benzene in Gasoline Regulations as part of the Benzene Emission Number equation
- CGSB sets vapour pressure requirements according to geographic zone and time of year for gasoline imported into Canada and distributed from primary terminals
 - Winter range: 85 kPa to 107 kPa for arctic and northern Canada
 - Summer range: 35 kPa to 55 kPa for Vancouver and 35 kPa to 62 kPa for Toronto

Fuel Additives

- There are no federal requirements regulating the usage or registration of additives; some provinces incorporate additives requirements via the CGSB standards referenced in their regulations
- The *Fuels Information Regulations, No. 1* requires reporting information on additives that are contained in fuels produced or imported
 - Additives added downstream of these points, such as at terminals, are not captured
- *New Substances Notification Regulations (Chemicals and Polymers)* requiring notification of new substances produced or imported into Canada over a certain weight or volume threshold may apply to additives or their constituents
- CGSB allows additives that are designed and tested to enhance performance in amounts less than 1.0% by volume, unless otherwise specified in the standard
 - Includes metal deactivators, oxidation inhibitors, corrosion inhibitors, icing inhibitors and fuel system detergents, lubricity, diesel ignition quality, low-temperature flow and electrical conductivity
 - Gasoline standard: requires effective fuel system detergency specifying limits for valve deposition; all Canadian major branded fuels contain deposit control additives
 - Diesel standard: requires conductivity-improver and lubricity additives specifying dosage giving acceptable performance

Thank you and Questions?

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