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Biodiesel

Mining Diesel Emissions Council

16th Annual MDEC Conference

October 5 2010

S. Brian Ahearn

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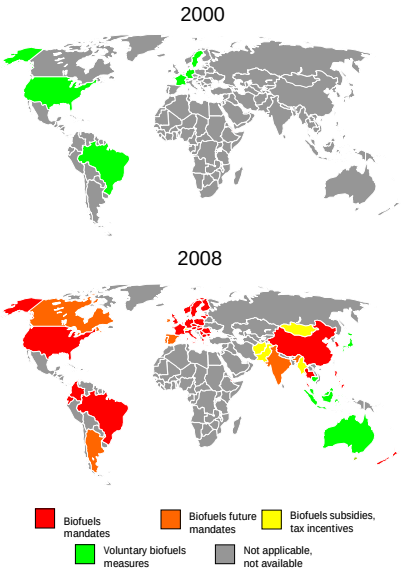
World – Regulatory Overview



Overview

- Biofuels expanding globally
- US / EU driving new technology
- Pace uncertain

2022 Potential % Biofuels	Ethanol	Biodiesel
US	26	2
Europe	16	11
Asia Pac	5	1
World	14	3

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Biofuels

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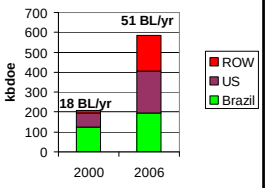
1st Generation Biofuels

- Ethanol from corn/wheat or sugar cane
- Biodiesel from vegetable oils or animal fats

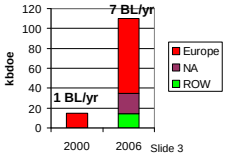


Fermentation → Ethanol

Raw Material | **Process** | **Fuel Product**

Esterification → Biodiesel*

* FAME Fatty Acid Methyl Esther



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Canada Federal Renewable Fuel Standard RFS

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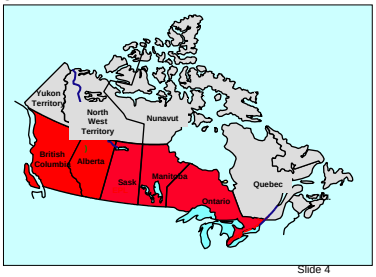
Federal RFS Overview

- Final regulation issued September 1 2010
- Ethanol - annual pool average of 5% effective Dec 15 2010 (1st compliance period 24.5 mons)
  - based on gasoline production & imports
- Biodiesel - provision for 2% pool average, with effective date to be determined (by RFS amendment)
  - based on diesel & heating oil production & imports
  - technical feasibility assessment (Natural Resources Can) of biodiesel under Canadian conditions underway
- No GHG emission limits; no 'biases' for next-generation biofuels
- Hydrotreated Vegetable Oil (HVO) and Biocrude co-processing permitted
- Geographical exemptions - north of 60° and Newfoundland (gasoline)
- Use exemptions - exports, kerosene and military diesel
- Provincial biofuel compliance count towards Federal compliance

Provincial RFS Overview

	Ethanol	Biodiesel
Ontario	5.0 %	-
Saskatchewan	7.5 %	-
Manitoba	8.5 %	2.0 %
British Columbia	5.0 %	3.0 % (5% by 2012)
Alberta*	5.0 %	2.0 %

* min 25% less carbon intensity than gasoline/diesel



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RFS Biodiesel Compliance

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Federal RFS

- Government's drivers for Renewable Fuels Strategy are reduce GHGs from fuel use, encourage domestic biofuel production, accelerate new biofuel technologies, and provide new markets for agricultural/rural
- Environment Canada's RFS is under CEPA (Canadian Environmental Protection Act)
- Obligated parties are Primary Suppliers (a producer or importer of gasoline, diesel/heating oil)
- Compliance is on a company basis
- 5% ethanol & 2% biodiesel is annual pool average ie not every litre requires renewable fuel

RFS Biodiesel Compliance

- Typically, fuel providers will buy FAME biodiesel, and blend a B5 diesel at the truck loading rack
  - B5 is a 5% blend (5% FAME, 95% diesel)
  - B5 meets CGSB specification (Canadian General Standards Board)
- Biodiesel supply currently averaging 20/80 domestic/import (US)
- B5 currently offered in the Vancouver and Winnipeg supply orbits
  - future locations may include Edmonton and Montreal/Toronto supply orbits

Biodiesel Challenges

- Low-temperature operability/stability concerns
- OEM warranty limits of 5% forces other options to meet pool average
  - limited biodiesel in northern zones (ie colder than – 15 C cloud Low Temperature Operability)
  - standard customer offer blends capped at B5 to honour OEM warranties

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Biodiesel

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Background

- Federal RFS proposes 2% renewable fuel content in diesel fuel and heating oil
- Conditional upon successful demonstration of renewable diesel under Canadian conditions
  - industry sectors and end-users raised questions for large-scale integration
  - National Renewable Diesel Demonstration Initiative (NRDDI) aimed to address these questions in advance of the proposed regulations coming into effect

Biodiesel Research Project

- Imperial Oil and Canadian Petroleum Products Institute (CPPI) have vested interest for successful transition to renewable diesel
- Main areas of concern:
  1) Cold flow performance of finished fuel
     - filterability/operability above cloud point, vehicle operability
  2) Stability
     - long term storage particularly at low temperatures
     - high temperature deposit formation in engines and furnaces
- Study conducted at the Imperial Oil Sarnia Research Centre

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Biodiesel Research Project

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Overview

- Designed to understand technical issues, provide guidance for decision-makers, blending formulation and standard-setting bodies to set specifications to ensure "fit for service" fuels
- Imperial Oil supported by Technical/Advisory Committee for technical peer review - included federal government, CPPI, Canadian Oil Heat Association (COHA), Canadian Renewable Fuels Association (CRFA) and Canadian Trucking Alliance
- Leveraged ongoing work in industry such as long term operability of B2 & B5 diesel in on-road heavy-duty engines (Alberta Renewable Diesel Demonstration), and test method development (ASTM, National Renewable Energy Laboratory)

Key Technical Outcomes

1) Long-term furnace operation and performance was negligibly impacted by fuel up to B10

2) Deleterious impact of saturated mono-glycerides (SMG) in renewable diesel on the low temperature operability of filters in fuel handling systems was further confirmed underscoring the need to limit their content to prevent potential field issues

3) Long-term storage stability of renewable diesel fuel can be assured via the use of commercially available oxidation control additives

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Research Summary & Full Reports – download at www.cppi.ca

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- contact Marc-Andre Poirier, Imperial Oil 519-339-2208

Biodiesel Research Project Final Report Summary

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Canadian Petroleum Products Institute | Institut canadien des produits pétroliers

Imperial Oil Esso L'Impériale

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Canada

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Research Department
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