Methanol Fuel Blending
ECTT: Energy Conference 2015
“Fuels – Future Trends”
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Overview

1. Methanex Corporation/Methanol Industry
2. Global Activity in Methanol Fuel Blending
3. Trinidad and Tobago Methanol Fuel Blending Initiative
Methanex Corporation & The Methanol Industry
Methanex Corporation

- Largest supplier of methanol in all major markets: ~15% global market share\(^1\)
- Production capacity: ~9 million tonnes
- ~$5 Billion Enterprise Value
- Wholly-owned Waterfront Shipping subsidiary
- A Responsible Care\(^\circledR\) company
- Approximately 1,100 dedicated employees globally
- A publicly traded company:
  - NASDAQ Global Market (“MEOH”)
  - TSX (“MX”)

\(^1\) Global market share is Methanex’s share of total methanol sales excluding methanol consumed by integrated MTO producers. Source: Methanex
Methanex’s Global Operations
Methanol Applications

Traditional Uses
(60% of Demand)

- Formaldehyde
  Wood Industry, Pharmaceuticals, Automotive

- Acetic Acid
  Fleece, Adhesives, Paints

- Methyl Methacrylate
  PMMA- LCD screens, automotive

- Methyl Chloride
  Silicones

Energy & MTO
(40% of Demand; High Growth)

- Fuel Blending
- DME (di-methyl-ether)

- Methanol-to-Olefins

- MTBE

- Marine Fuels
Methanol Fuel Applications
• Northern Europe and North America introducing tighter ship emissions regulations starting Jan 2015 in ECA’s (0.1% sulphur). In 2020, IMO scheduled to require all marine fuels globally to be less than 0.5% sulphur

• Methanol is a solution to meet new regulations
Methanol Being Commercialized as a Marine Fuel

- Engine manufacturers (MAN, Wärtsilä) developing diesel engines compatible with methanol (flex-fuel)
- Standards and regulations under development
  - Risk Classification Societies – DNV, Lloyd’s Register
  - Marine fuels regulations being updated for methanol
- Stena converting Germanica (2015) and potentially up to 25 ferries to methanol in Northern Europe
- Methanex (Waterfront Shipping) taking delivery of seven new methanol ships in 2016
- Significant interest developing in Europe, North America & Asia
DME An Emerging Transport Fuel

- High Cetane number make DME attractive for use in diesel engines
- Volvo commercializing DME for heavy trucks (Class 8); targeting North America for introduction
- Global ASTM Standard for DME issued
- Lower truck and infrastructure costs vs other alternative fuels (ie; CNG, LNG)

Volvo DME Truck

- Economical
- High Performance
- Ultra-low Emissions (No Soot or Particulate Matter)
- Low Infrastructure Costs
- Easy to handle, store, dispense
- 95% GHG reduction potential (biomass)
Other Developing/Potential Energy Markets

• Methanol in diesel engines (road transport)
• Methanol to Power (typically in remote geographies)
• Fuel Cells
  • Commercial ready markets: (ie; telecom power, forklifts)
  • Electric-methanol fuel cell hybrid vehicles projects (Denmark, Germany)
Methanol Fuel Blending

- Key Drivers
- Standards & Regulations
- Global Fuel Blending Activity
Methanol Fuel Blending – Key Drivers

- Economics
  - Competitive
  - Existing liquid fuels infrastructure
  - Vehicle compatibility

- Clean-burning
  - Stringent environmental regulations

- Energy security

- Safety

- High Octane
  - Performance
  - Reduces emissions

- Renewable Feedstock
Methanol Fuel Blending – Global Activity

- Egypt
- China
- Australia
- U.K.
- Netherlands
- Switzerland
- Denmark
- Russia
- Azerbaijan
- Iran
- Uzbekistan
- Israel
- Turkmenistan
- Vietnam
- Alaska
- U.S.
- Trinidad & Tobago
- New Zealand
- Iceland

Legend:
- **Yellow**: Commercial / near-commercial
- **Blue**: Assessment/demonstration stage
Fuel Blending Demand Growth in China

Key growth drivers:
Provincial standards & emissions reduction (PM 2.5)

- National standards of M85 & M100 issued in 2009
- 14 provinces have published local standards (mainly for low methanol content blends) and prompted the applications of methanol gasoline province-wide or in selective cities/districts.
- Increasing vehicle ownerships, growing gasoline demand, and the expected release of long-awaited national standards of low methanol content M-gasoline will further boost methanol demand in the fuel sector.
Methanol Fuel Blending - Israel

- Large gas finds
- Strategic need to reduce oil dependence
- Methanol program carried out by Dor Chemicals and supervised by governmental steering committee
- M15 Initial Focus
  - M15 demonstrations completed (13 vehicles, 900,000 km, 2 years)
  - M15 testing being expanded to more vehicle types
  - Working on M15 Standard
- M70 testing program – validate high methanol blends in FFV’s
- Targeting commercial introduction of methanol fuels over next couple of years

Reduce the usage of oil by 30% by 2020 and 60% by 2025

Source: Fuel Choices Initiative, Prime Minister’s Office, Israel
Carbon Recycling International - Renewable Methanol in Iceland

- Renewable Methanol from CO₂
- 90% CO₂ reduction
- Sold into methanol fuels in Europe and Iceland
- Tripling capacity in early 2015
- Significant expansion planned over next few years
- Methanex is currently a shareholder in CRI

CRI’s GO Plant in Svartsengi, Iceland
Methanol Fuel Blending – United States

• Momentum developing for methanol fuels in the U.S.
  • Shale Gas
  • Fuel Freedom Foundation
  • US Energy Security Council
  • Open Fuel Standard
  • Joint Alcohol Fuel Alliance
• Dr. Ernest Moniz, U.S. Secretary of Energy and co-author of MIT study recommending Methanol Fuels
  • MIT Study - “The U.S. government should implement an open fuel standard that requires automobile manufacturers to provide tri-flex-fuel operation in light-duty vehicles.”
Methanol fuels being commercialized in Australia

- Project led by Coogee. Methanex is a partner
- Path to energy security
- Methanol excise tax free status for 10 years (~A$38c/litre, ~$US 480/t)
- Successful road tests completed
- Testing program (Orbital Corp.) shows positive results
  i. improves engine performance
  ii. is less expensive on a cost per mile driven
  iii. improves air quality
- Commercial roll out of GEM8 and GEM56 early 2015; GEM15 in the future
Methanol Fuel Test Results - Australia

Key results versus gasoline/ULP

- Higher Performance at lower cost per mile driven
- GEM15 reduces PM2.5 by ~40%. Blends containing methanol show lower PM than ethanol-only blends
- GEM15 reduces THC by ~20% (higher reductions with more methanol)
- Lower NOx compared to regular and premium gasoline
- CO and CO$_2$ (tank to wheel) similar to ULP

Source: Orbital Interim Test Results, March 2014
Displace high value imported oil with domestic resource

Cost savings / **Subsidies reduction**

Environmental Benefits

Methanol fuel blending program has minimal barriers

- No major technical hurdles
- Modest capital cost / Minimal changes to existing infrastructure
- No changes to vehicles (ie; M15)

Targeted pilot program in partnership with Egyptian General Petroleum Corporation (State Owned) scheduled for 2015

Future Potential - a few hundred dollars to modify a car to operate on high methanol blends (ie; M85); diesel market; other energy applications?
Trinidad and Tobago
Methanol Fuel Blending
Regional Issues

Caribbean / Latin America's issues:

• High energy costs
• Current fuel supply limitations
• Tight environmental policies

Drivers for Methanol Fuel Blending Locally

- Derives maximum value for our local product.

- Fuel Blending in Trinidad and Tobago can support issues facing Caribbean/Latin America.

- New demand will be positive for longevity of the local Methanol Industry.

- Fuel blending will support reducing local subsidies.
Trinidad and Tobago’s Methanol/Derivatives Industry can bridge the gaps:

- Minimal additional infrastructure requirements.
- Relative ease of entrance into market.
- Timely delivery of product when required.
- Reliable long term supplier.

Blending methanol also allows the oil refiners

- To expand gasoline production quickly, thereby meeting growing demand at relatively low cost
- To upgrade regular gasoline production to higher premium grade gasoline. Meet new environmental specifications

Local Studies – Methanol Fuel Blending

Key conclusions in line with established facts:
• Reduced CO emissions
• Reduced hydrocarbon emissions
• Minimal change in fuel consumption

Conclusion/Recommendation:
• Pilot testing program of vehicles
• M15 could be used in local gasoline

Source: Emissions and Fuel Consumption of Methanol-Gasoline Blended Fuels for Use in Trinidad and Tobago. Dec 2014 – Kiran Gopaul and Dr. Graham King
Methanol Fuel Blending MOU

- Local methanol industry as one body to spearhead initiative
- Investigate subsidy impact
- Additional option for liquid transportation fuel
- Signed MOU on September 03, 2010
- Test the technical aspects of blending methanol in gasoline
- Evaluate commercial and strategic benefits for Trinidad and Tobago
Fuel Blending Study

Contributors to the Report:

1. Trinidad and Tobago National Petroleum Marketing Company Limited (NP)
2. The Petroleum Company of Trinidad and Tobago (Petrotrin)
3. Methanol Holdings (Trinidad) Limited (MHTL)
4. Methanex Trinidad Limited
5. Ministry of Energy and Energy Affairs (MEEA)
Low level Blends investigated ( <20% Methanol)

• Introductory Blend (Premium Grade Market)

Summary of Key Findings:

• Environmental/Fire Safety Benefits
• No technical show stoppers especially
• Premium fuel market ideal for introduction
• Similar to other countries, revision of the fuel specification is necessary
• Co-solvent and corrosion inhibitor necessary
Closing Remarks

• Extracts value for our local product nationally
• Provide support for Caribbean/Latin America long term
• Encourages other methanol fuel blending programs in the region
• Increases methanol demand in Atlantic Basin
• Environmental benefits
• Modest capital cost / minimal changes to existing infrastructure
• No changes to vehicles
• Continue to partner with government and industry to implement pilot testing program for Methanol fuel blends
Thank You