Methanol: The Ultimate XTL Fuel



Greg Dolan, Vice President
Methanol Institute
World XTL Summit
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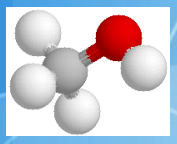
Vision + Strength = Voice


- The Methanol Institute serves as the trade association for the global methanol industry.
- Members are the world's leading methanol producers, distributors and technology leaders.
- MI works to protect existing methanol markets and lead the development of emerging markets.

2010 Members

Tier 1

Tier 2

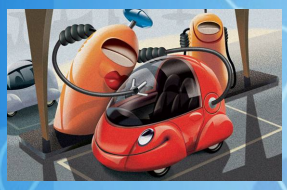
Tier 3

Tier 4

Alternative Fuel Factors

- Factors to address for any alternative to gasoline/diesel fuels:
  - **Size of the energy resource base must be large;**
  - **Impact on the economy;**
  - **Effect on the environment; and**
  - **Acceptance by consumers.**

Methanol Factors



- The ultimate XTL fuel, methanol can be produced from natural gas, coal, any organic biomass matter, even atmospheric CO2.
- Lowest-cost alternative for fuel, infrastructure, and vehicles.
- Cleaner than gasoline, potential for net zero greenhouse gas.
- As a liquid, the methanol transition would be “invisible” to consumer.

Methanol Flexible Fuel Vehicles

- Between 1987 and 1999, over 17,000 methanol FFVs and hundreds of transit buses and school buses sold in CA.
- CA established network of 60 public retail stations and 45 private fleet stations, dozens of fueling stations in other states.
- By 1993, California consumed 12 million gallons of methanol per year.
- Conclusion: No technical barriers to methanol’s use as an alternative fuel.

"Fuel of the Moment" Syndrome

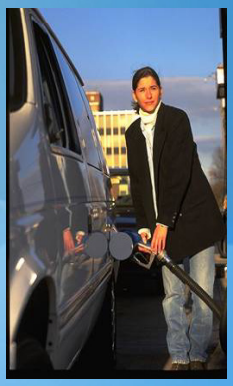
- By mid/late-1990s, Americans returned to state of complacency about fuel security, and methanol fell out of favor.
- Air quality became driver:
  - Methanol's emissions benefits diminished as reformulated gasoline got cleaner.
  - Automakers turn to compressed natural gas with low emissions.
  - California policy makers and environmentalist turn to zero emission electric vehicles.
- E-85 offers automakers slight cost reduction and broad political support.

Coming Full Circle

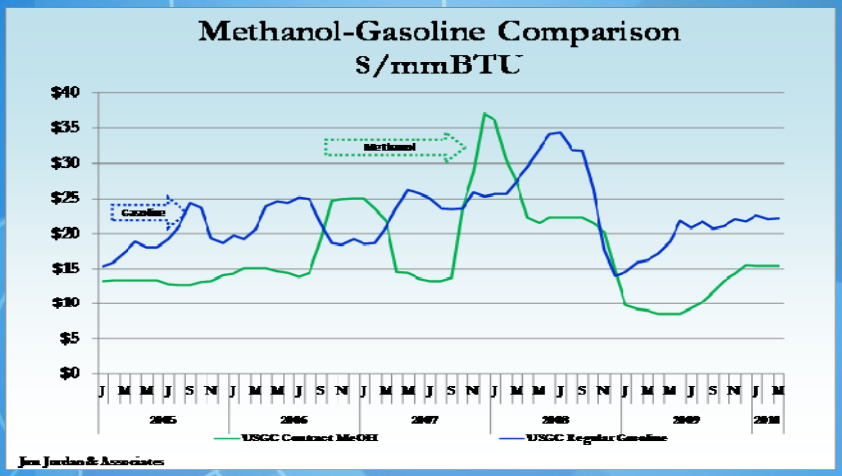
- We have now experienced another global oil price shock, and energy security is at the top of the policy agenda.
- The range of benefits that made methanol stand out at the dawn of alternative fuels, are even more relevant today.

Methanol Fuel Costs

- 10¢ Regional Distribution
- 5¢ Local Distribution
- 5 ¢ Retail Mark-up
- 9 ¢ Federal Tax
- 9 ¢ State Tax (CA)
- $0.76 Wholesale Methanol Cost
- $2.27 Wholesale Gasoline Cost
- M-85 Pump Price of $1.37 per gallon
- **Consumer Cost = $2.25 per gasoline equivalent gallon**
- **U.S. Pump Price for Gasoline = $2.89 per gallon**



Methanol Energy and Volume Value



Open Fuel Standard Act

- Legislation introduced in U.S. Congress to require automakers to provide “GEM” (gasoline, ethanol, methanol) Flexible Fuel capability to 50% of new cars by 2012 and 80% by 2015.
- House-passed Energy Bill including modified OFS provisions, pushing Senate for inclusion of full bill.
- OFS could serve as global model.

China Leading Global Methanol Industry

- **China world’s largest methanol producer and consumer.**
- **China over 120 methanol plants, many small and inefficient.**
- **Curtailing natural gas-based production.**
- **Coal-based production accounts for 85% of growth.**

Year	Tons	Gallons
2004	6,000,000	2 Billion
2007	15,000,000	5 Billion
2009	25,000,000	8.3 Billion
2012	37,000,000	12.3 Billion

Source: MMSA

China Methanol Fuel Blending

- According to estimates, as much as 5 million metric tons (1.7 billion gallons) of methanol blended in gasoline in 2009.
- Methanol now represents 5-7% of China's transportation fuel pool.
- Methanol prices have been consistently below the mandated pump price for gasoline, creating an economic incentive for methanol fuel blending.

From Coal Provinces

- Provincial leaders in 14 coal – producing provinces have been running methanol fuel demonstration programs (Xinjiang, Shanxi, Shaanxi, Henan, Inner Mongolia, Beijing Shi, Hebei, Anhui, Guangdong, Sichuan, Guizhou, Liaoning, Heilongjiang and Ningxia).

Shanxi Model

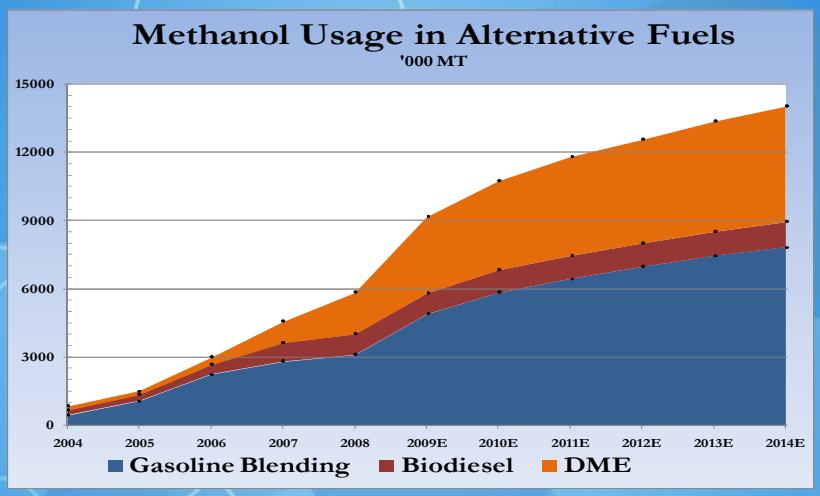
- Northern Shanxi Province (pop. 33 million) has been demonstrating methanol fueled vehicles for 20 years.
- By 2008, Shanxi operating:
  - 1000 methanol fueling stations (Sinopec, PetroChina, Independents).
  - Over 2,000 M-100 Taxis.
  - 300 M-100 Buses.
  - Refueled vehicles 40 million times.

National Methanol Standards

- **China's Committee on Standardization has approved methanol standards:**
  - **Denatured Methanol Fuel for Vehicles – M-100 (1 Nov 2009)**
  - **High Proportion – M-85 (1 Dec 2009)**
- **Completing work on Low Proportion – M-15 – standard.**
- **MI provided detailed technical comments used in the development of China's national standards.**

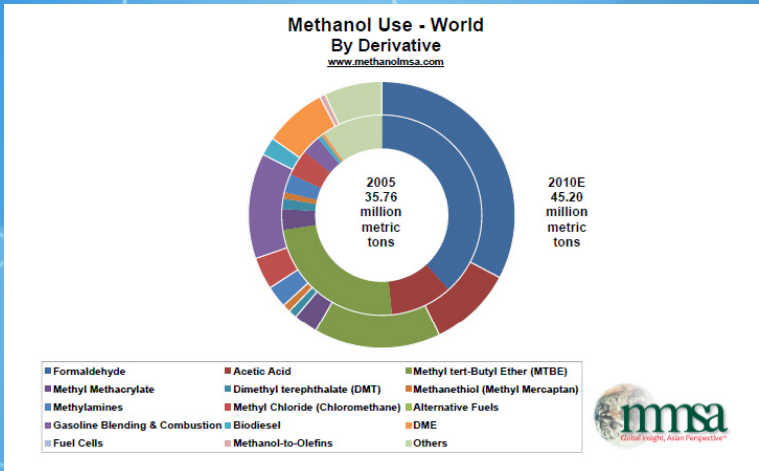
Sinopec: ***"The standards will surely facilitate supervision over the current methanol market, and will define the way of methanol development in the future."***

The Time Has Come

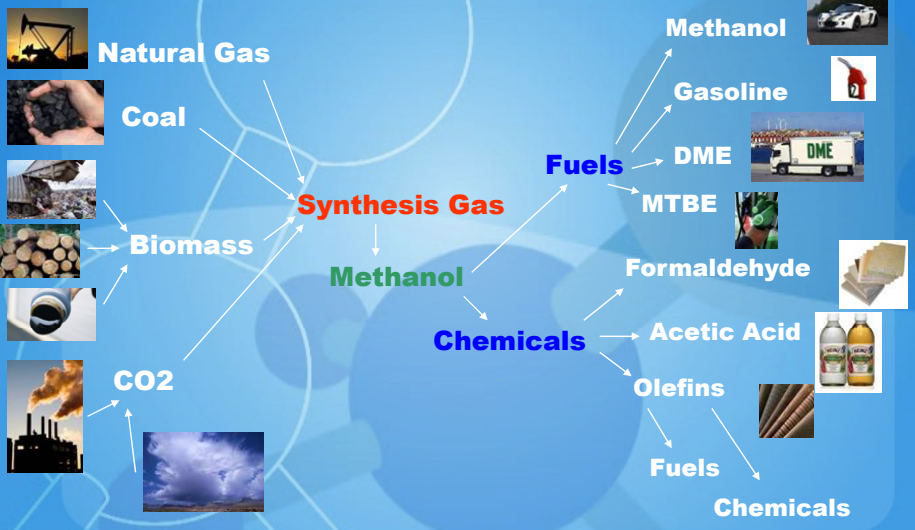


Source: Jim Jordan & Associates

Methanol Global Demand



Polygeneration



BioMCN

- Based in the Netherlands, BioMCN is the first company to start production of bio-methanol on an industrial scale from crude glycerin, a byproduct of biodiesel fuel production.
- In 2009, BioMCN opened a full commercial-scale plant which is able to produce 200,000 metric tonnes of bio-methanol a year.

Chemrec

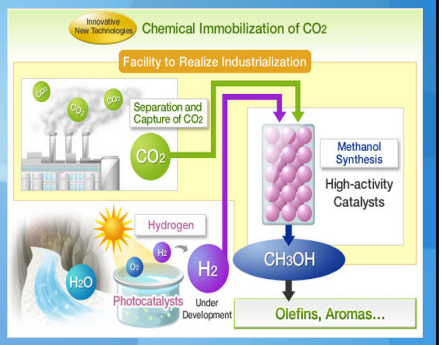
- With facilities in Sweden and the United States, CHEMREC enables pulp and paper mills to become Biorefineries.
- Through the application of their unique black liquor gasification technology, mills can expand to new markets by producing sustainable, low-carbon chemicals and fuels by reusing their black liquor waste for the production of bio-methanol.

Carbon Recycling International

- The “George Olah” Plant currently under construction in Iceland.
- Producing renewable methanol from industrial waste CO2 and hydrogen from geothermal energy.
- Initial capacity of 2 million liters per year.
- Renewable methanol to be blended with gasoline at OLIS stations.

Mitsui Chemicals, Inc

- One of Japan's leading chemical companies
  - Member of the Methanol Institute
- Developed a technology to turn factory exhaust CO2 gas into methanol which will then be used to create other commercial products.
- 100 metric ton per year pilot plant opened in 2010.



Gulf Petrochemicals Industry

- Based in Bahrain
  - Opening the Middle East's first carbon dioxide recovery plant at the GPIC facility in Sitra.
- Recovers CO2 from the flue gas emitted at the GPIC petrochemical plant and utilizes the captured CO2 to increase urea and methanol production.
  - Absorbs CO2 into Mitsubishi Heavy Industries KS-1 proprietary solvent.

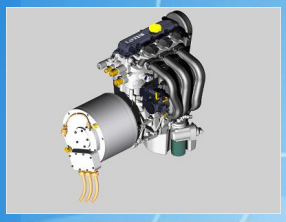
DKRW Advanced Fuels

- Planning to build a mine mouth coal gasification plant in Wyoming to produce methanol using the GE Gasification process.
- The facility will then use ExxonMobil MTG process.
  - Coal converted to syngas using GE gasification technology.
  - The syngas cleaned and converted to methanol using Davy Process Technology's Methanol Technology.
  - The methanol is then converted to gasoline using ExxonMobil MTG Technology

Haldor Topsoe

- Danish catalyst & technology company
- Created a cost-efficient process using their unique methanol catalyst for the synthesis of methanol from syngas produced by gasification of coal.
  - An acid gas removal unit is included for removal of hydrogen sulfide and excess carbon dioxide.
  - The process is designed for production of methanol conforming to American Federal Grade AA standards.

Lotus Example



- Methanol key to evolution of auto industry towards "decarbonized" transport.
- *"Using modern control technology the conversion of existing production vehicles to tri-flex-fuel operation on gasoline, ethanol and methanol is therefore straightforward and can be achieved with very low on-cost."* SAE 2009-01-2764

Methanol "XTL" Flexibility

- Multiple feedstocks.
- Multiple markets.
- Mature technologies.
- Market growth.
- Clean, Green and Cost Effective.

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