

# Methanol Transportation Fuels: From U.S. to China

Methanol Institute



**Gregory Dolan**  
***Vice President***

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**IAGS Briefing**  
**U.S. House of Representatives**  
**April 16, 2008**

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# Methanol Institute

Methanol Institute



- **MI Established in 1989**
- **Serves as the trade association for the Global Methanol Industry**
- **Directs Product Stewardship Activities**
- **Initiates Market Development Efforts**
- ***The Voice of the Global Methanol Industry***

# 2008 Members

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**Ecofuel**



Colonial Group Inc.



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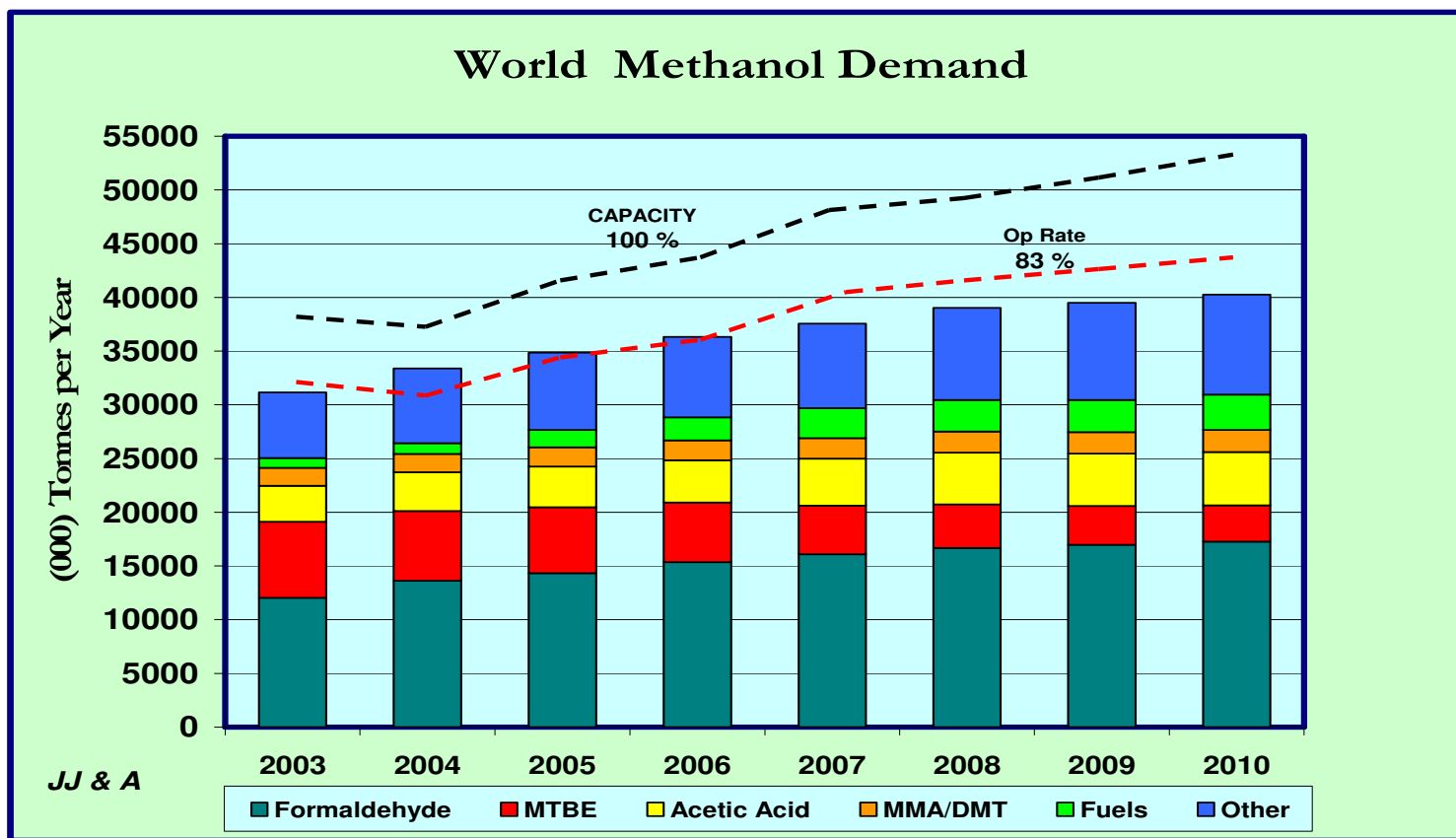


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# World Methanol Demand

40 Million Metric Tons = 13.3 Billion Gallons

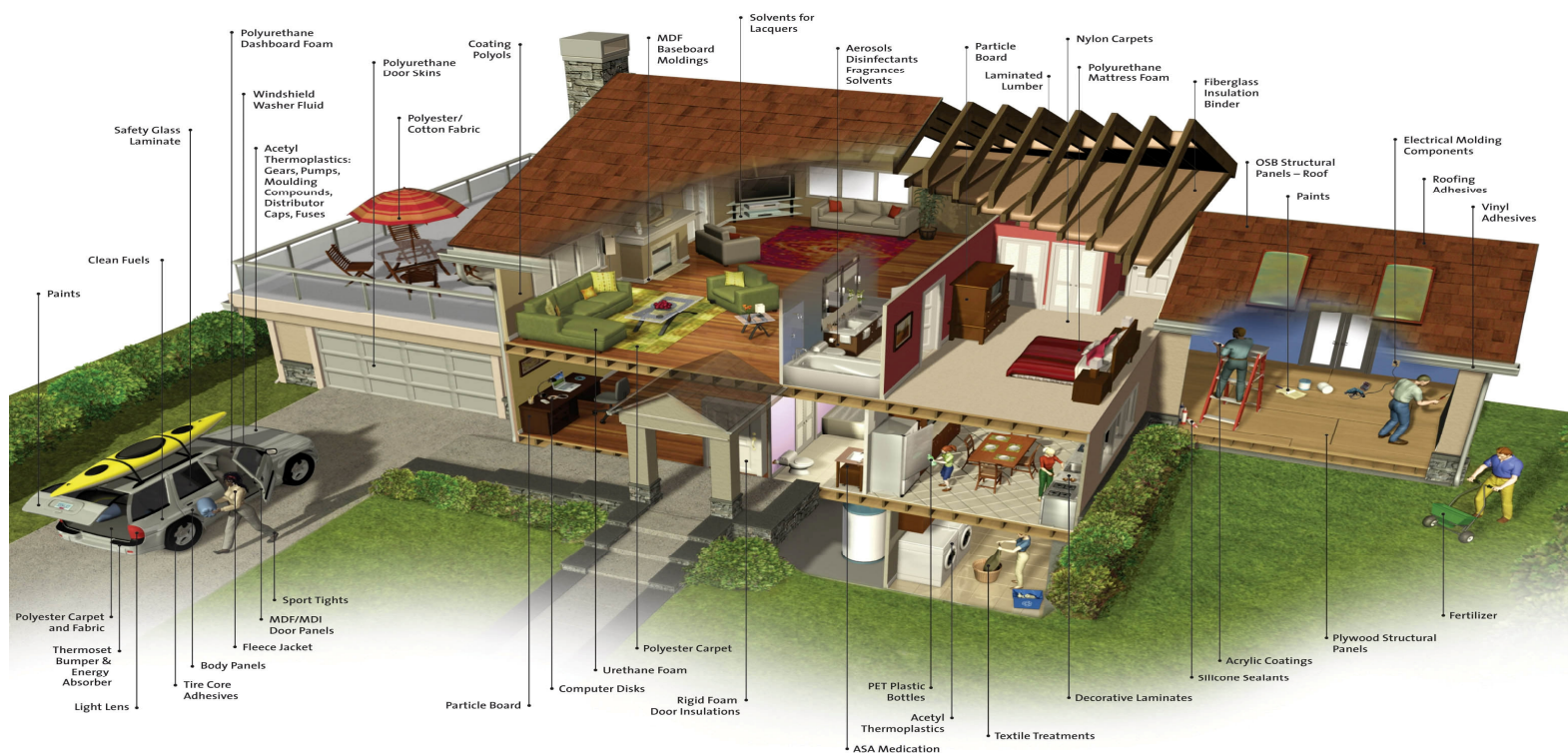
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JJ&A

# Methanol: Essential Chemical Building Block

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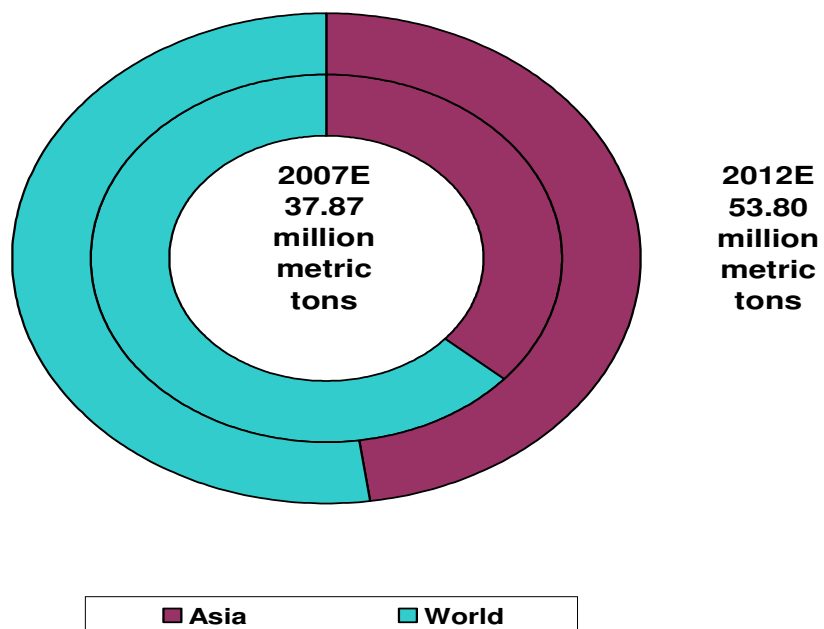


Source: Methanex

# Global Market

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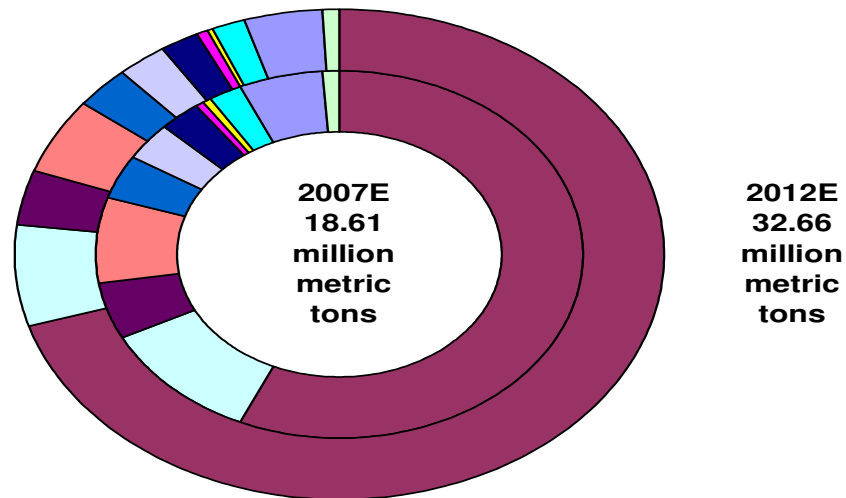
## Methanol Use - World vs Asia



# China Developing New Methanol Markets

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**Methanol Use in Asia**  
By Country

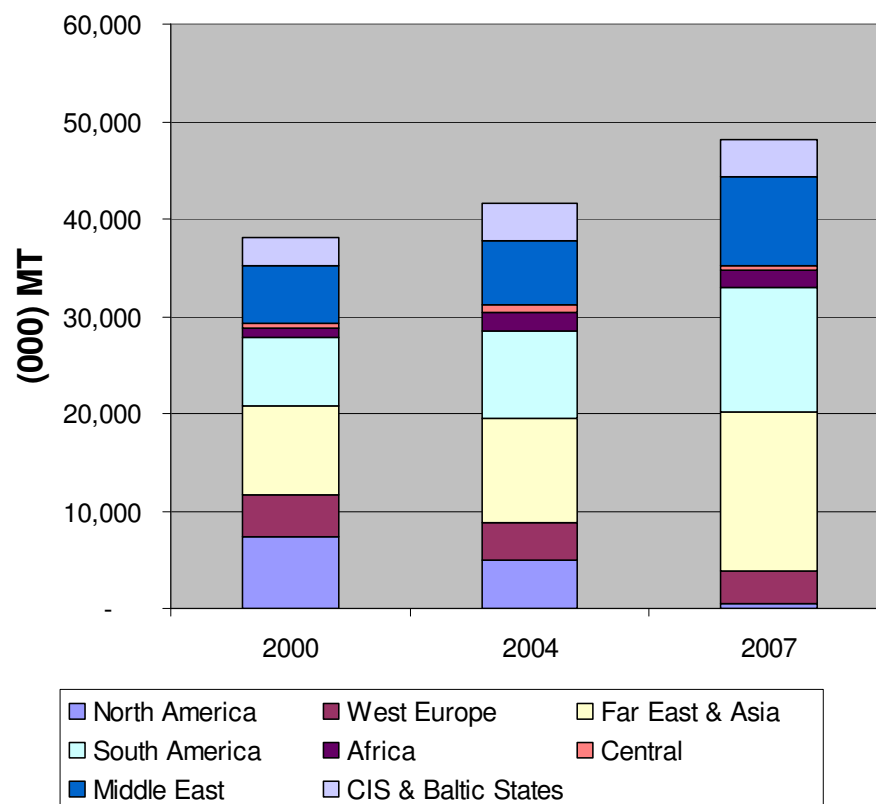


China	Japan	Taiwan	South Korea
Malaysia	Singapore	Indonesia	Australia
New Zealand	Other SEA	India	Other South Asia

# Shifting Global Methanol Production

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REGIONAL SUPPLY 2000 - 2007



Source: MHTL

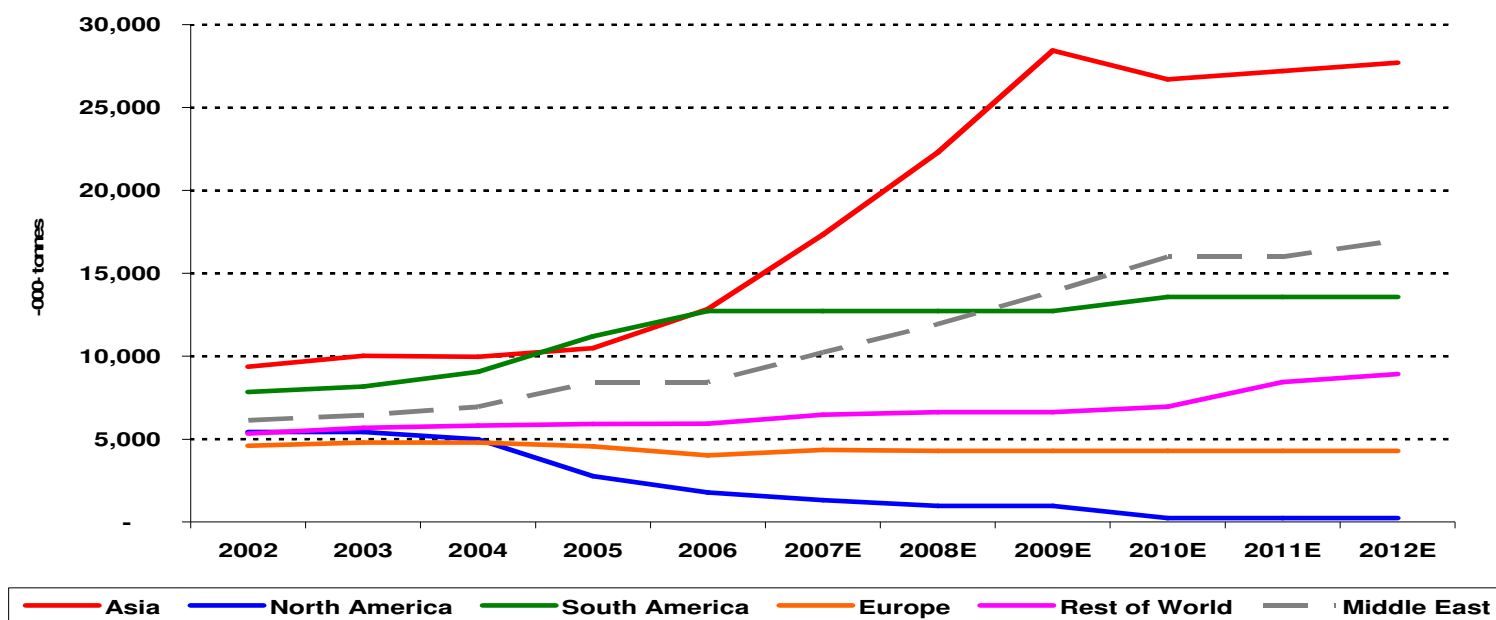


# China Has More Methanol Production Capacity Than The Middle East

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Supply Capacity for Methanol by Region

2002 - 2012E

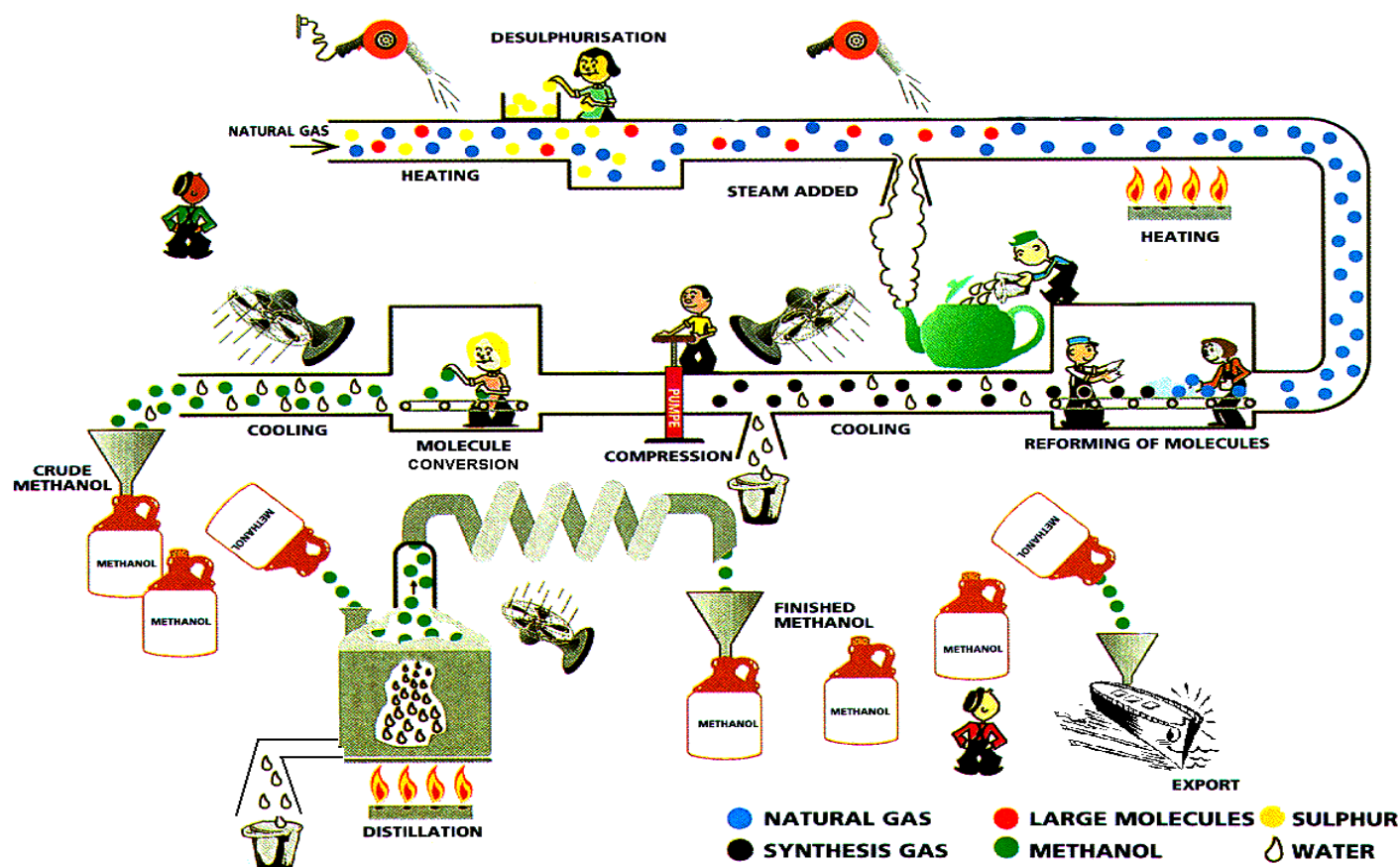


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# Methanol Production: Natural Gas

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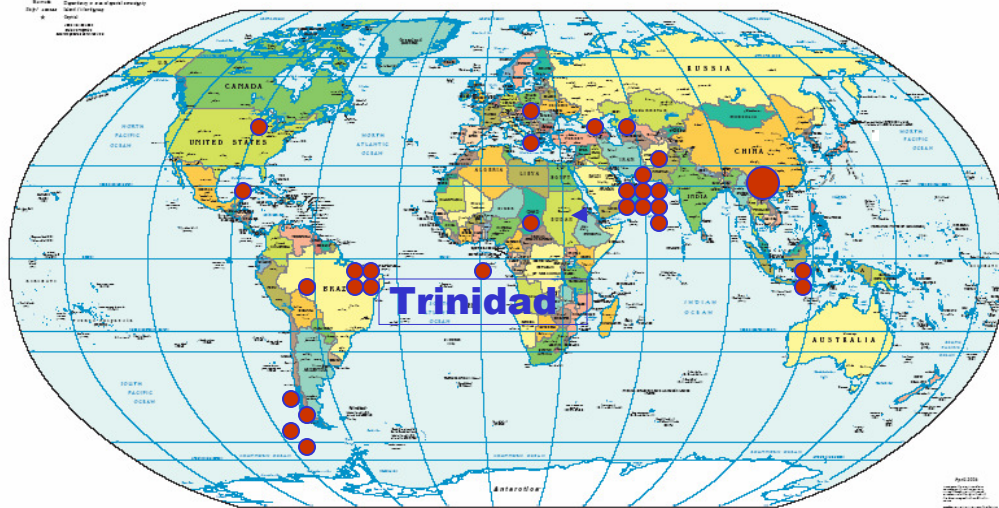
## THE METHANOL PROCESS



# Mega-Methanol Plants and Natural Gas Prices

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Political Map of the World, April 2006

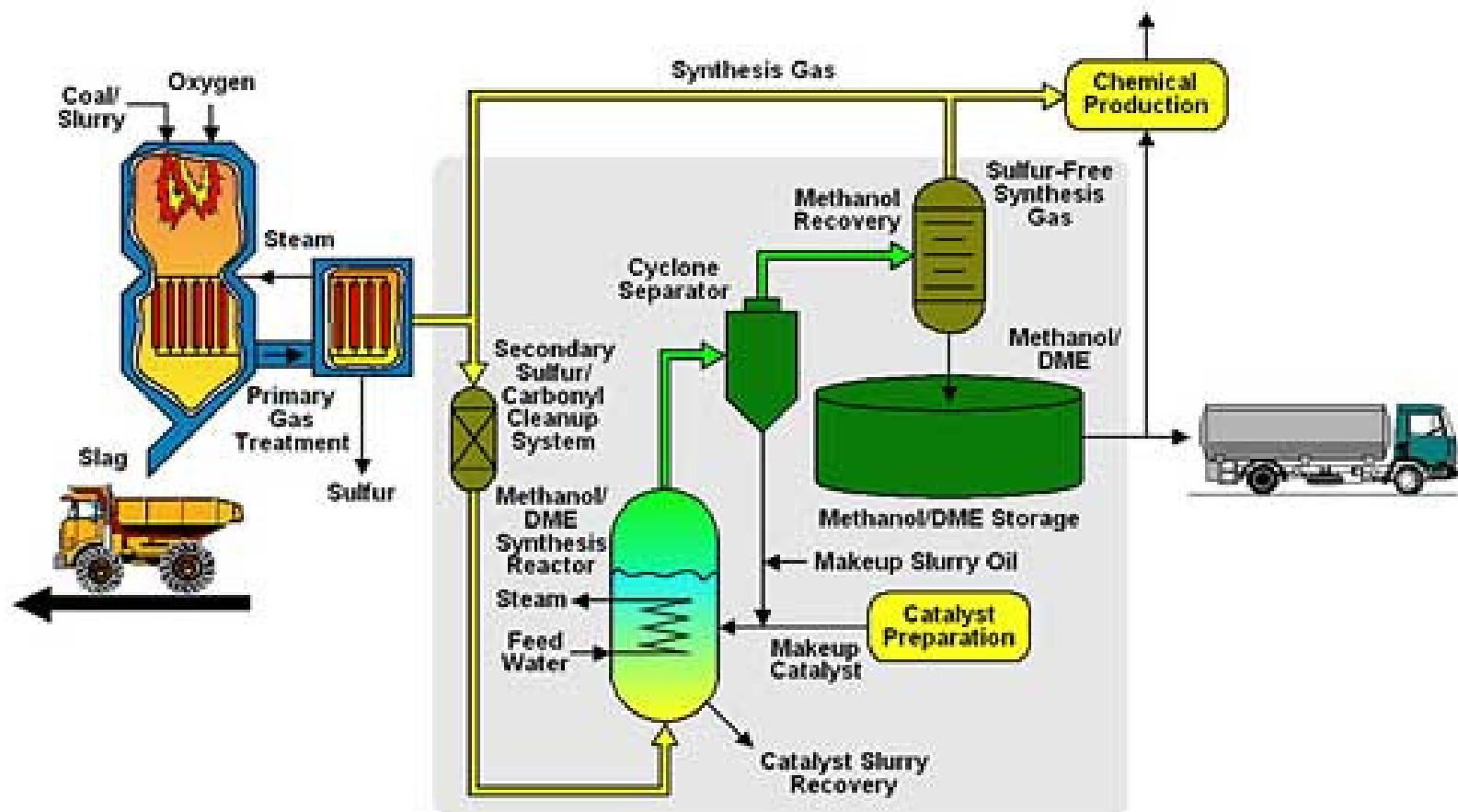


**2004-2007: Seven-mega plants started up with combined capacity of 10 million metric tons or 25% of current global demand.**

Region/Country	\$/MM BTU
Middle East	0.25-1.00
Trinidad/ Venezuela	1.50-2.00
Chile	2.00-3.00
Europe	6.00-8.00
USA	8.00-10.00

# Methanol Production: Coal

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# Methanol from Wood

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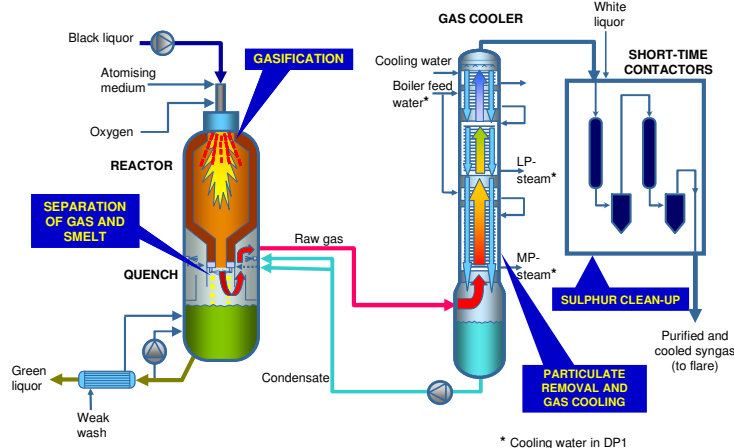
- **Methanol can be produced from the gasification of wood and other biomass resources.**
- **Mature Gasifier technologies: bubbling fluid-bed; indirectly-heated fluid bed; entrained-bed.**
- **Highly efficient, with energy efficiencies in the 60-70% range.**
- **One ton of wood produces 165-185 gallons of methanol (625-700 liters).**
- **Large Resource: U.S. generates 240 million tons waste wood per year.**

# Methanol from Black Liquor

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- In Sweden, a pilot-scale reactor is producing methanol from black liquor, a sludge byproduct of paper pulping.
- If every paper mill in the U.S. used this process, could produce 28 million tons of methanol per year (9.3 billion gallons).



© Chemrec AB 2005

# Methanol Flexible Fuel Vehicles

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- **Between 1985 and 1999, over 15,000 methanol FFVs and hundreds of transit buses and school buses sold in U.S.**
- **CA established network of 60 public retail stations and 45 private fleet stations, dozens fueling stations in other states.**
- **By 1993, California consumed 12 million gallons of methanol per year.**





# Methanol FFV Components

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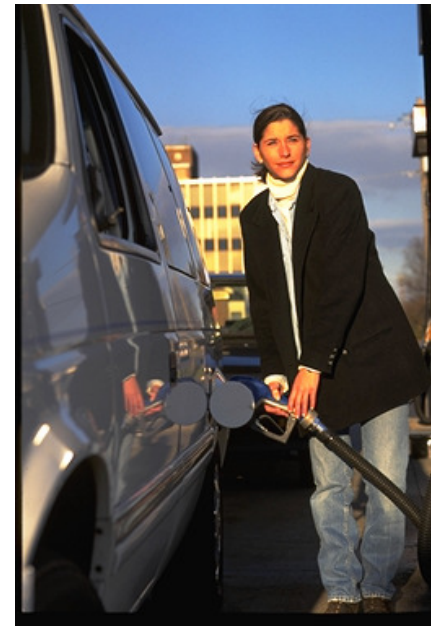
- **Alcohol sensor monitors fuel mixture and signals on-board computer to adjust fuel flow and timing.**
- **Larger fuel injectors.**
- **Stainless steel fuel system.**
- **Larger fuel tank.**
- **Block heater.**
- **Optimized cylinder head combustion chamber.**
- **Wear-resistant piston rings.**
- **Exhaust valve seat inserts.**
- **Incremental costs: \$50-\$150**



# Methanol Fuel Costs

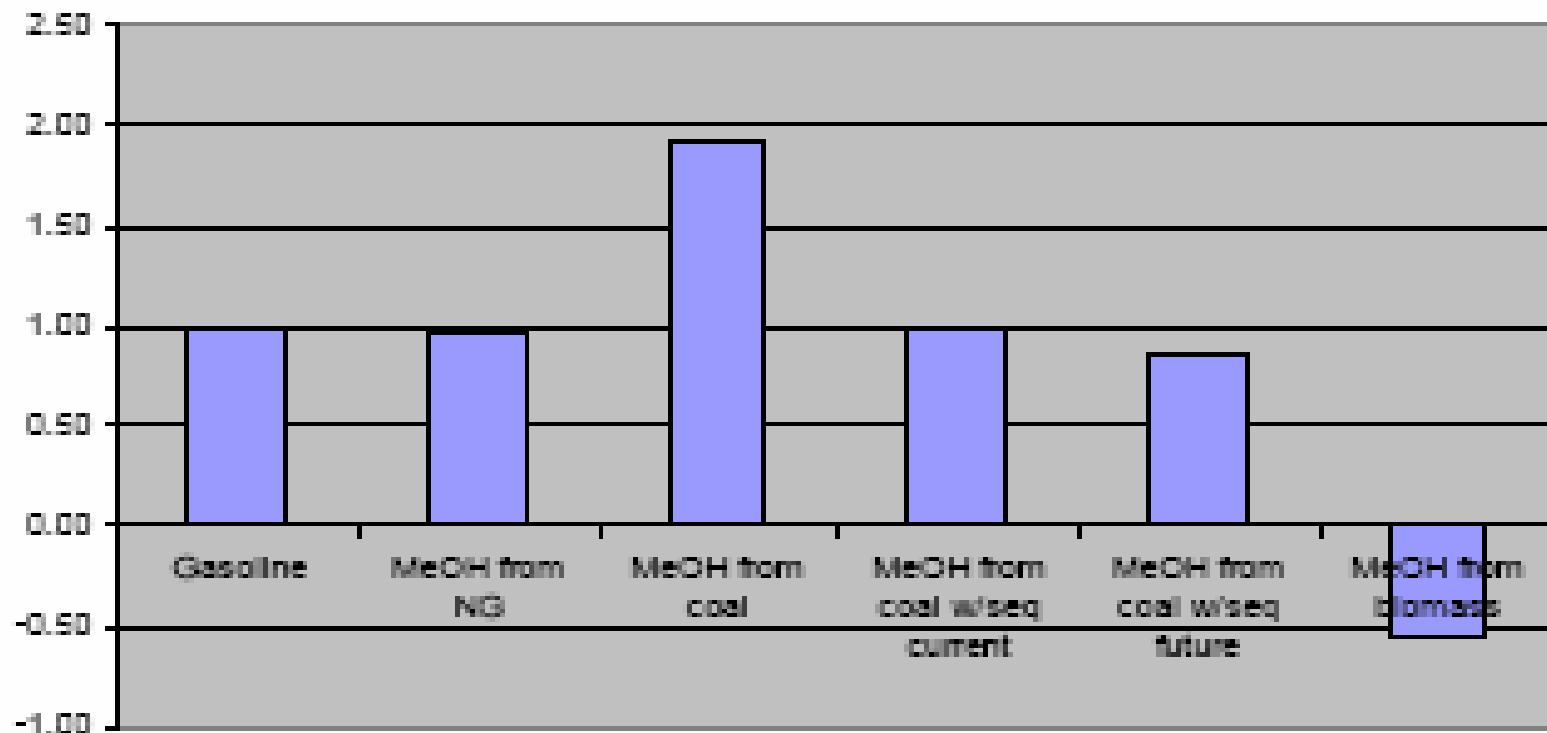
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- **10¢ Regional Distribution**
- **4¢ Local Distribution**
- **5 ¢ Retail Mark-up**
- **9.15 ¢ Federal Tax**
- **9 ¢ State Tax (CA)**
- **\$1.00 Wholesale Methanol Cost**
- **Pump Price of \$1.37 per gallon**
- **Consumer Cost = \$2.03 per gasoline equivalent gallon**



# Methanol Greenhouse Gas Emissions Relative to Gasoline

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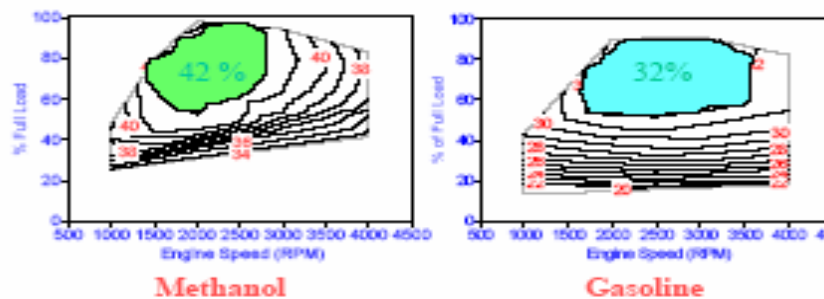
Source: Prepared for Methanex by Richard Bechtold, Alliance Technical Services

# EPA Developing Highly Efficient Alcohol Engines

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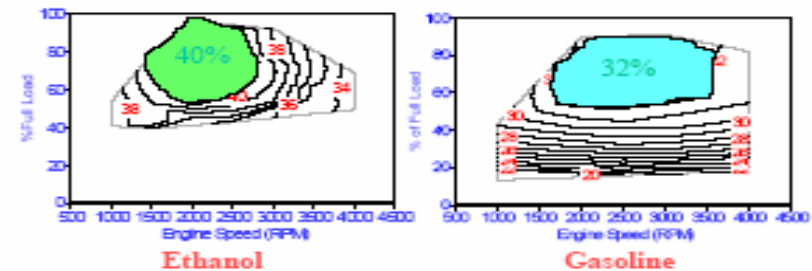
## Efficiency: Methanol



33% higher efficiency with methanol  
Broad region of high efficiency



## Efficiency: Ethanol



25% higher efficiency with ethanol  
Further optimization ongoing

# Methanol Fuel Blending

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	Gasoline	Methanol
<b>Fuel Costs</b>	—	+++
<b>Multiple Feedstocks</b>	X	+++
<b>Emissions</b>	—	+
<b>Safety</b>	—	+++
<b>Environment</b>	—	++
<b>Use Current Engines</b>	—	+ (M-15) - (m-100)
<b>Use Existing Stations</b>	—	+ (M-15) - (m-100)

## Key

— Baseline

X Not  
Applicable

+ Positive

- Negative

# U.S. Methanol Challenges

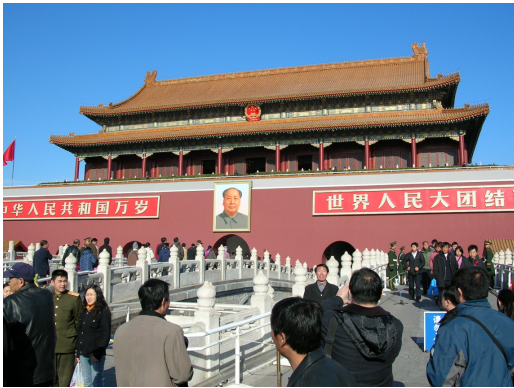
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- **Automobile Industry**
- **Fueling Industry**
- **Automakers**
- **Vehicle Operators**
- **Methanol Industry**



# China Contrasts

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# MI Delegation to China

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- **In December 2007, the Methanol Institute took delegation to China at invitation of Chinese Association of Alcohol and Clean Ether Fuels and Automobiles.**
- **Delegates: Methanol Holdings Trinidad; Methanex; SABIC; Johnson Matthey; Mitsubishi Gas Chemical; MAN Ferrostaal; Helm**
- **Visited Shanghai, Shanxi Province (Changzhi, Jinzhong, and Taiyuan), and Beijing**

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# China Methanol Production

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- **China now world's largest methanol producer and consumer.**
- **China has over 130 methanol plants, mostly small and inefficient.**
- **Curtailling natural gas-based production.**
- **Huge growth coal-based production.**



Year	Tons	Gallons
2005	6,000,000	2 Billion
2007	11,000,000	3.7 Billion
2010	20,000,000	6.7 Billion
2015	30,000,000	10 Billion

# China Methanol Fuel Blending

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- **According to MMSA: 2.71 million metric tons (900 million gallons) of methanol blended in gasoline in 2007**
- **An additional 800,000 tons of demand growth expected in 2008.**
- **Provincial “official” trials and “unofficial” blending.**
- **Methanol sells for RMB\$2,500 (US\$350) per ton, wholesale gasoline sells for RMB\$7,000 (US\$965) per ton.**

# Shanxi Provincial Trials

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- **11 cities with a total population of 33 million.**
- **260 billion tonnes known coal deposits, 1/3 China's total.**
- **200 buses and 1,000 taxis operating on M-100.**
- **M-15 first used in 2003 in four cities, now used in all 11 cities across the province in stations operated by PetroChina and Sinopec.**
- **Shanxi adopted four provincial methanol specifications in 2008.**



# China Automakers Lead the Way

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- **Chery Automobile completed demonstration of 20 methanol FFVs, now ready for full-scale production.**
- **Shanghai Maple Automotive building 50,000 methanol cars in 2008.**
- **Chang'an introduced methanol Ben-Ben car.**
- **Greely Automotive put Haifeng methanol car into production.**
- **Huapa Automotive built methanol cars.**
- **Shanghai Automotive Industry Corporation developing methanol cars.**

# Clock is Ticking

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- In 2007, China imported 47% of its oil, and this year may pass Japan as world's second largest oil importer.
- China banned use of grain for ethanol production to ensure food supplies.
- China is world's largest coal producer and consumer.



Prof. Ni Weidou, Tsinghua University-BP Clean Energy Center: *"The clock is ticking, and China needs to start adopting alternative fuels now in order to lessen its dependency."*

# Methanol Strategic Fuel For China

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- **In September 2006, eight leaders provided report to Chinese President Hu Jintao titled “Suggestion on Promoting Methanol Fuels to Replace Gasoline and Diesel Fuel.”**
- **President Hu approved this “Suggestion” and directed China’s powerful National Development and Reform Commission considers coal-based methanol to be a strategic transportation fuel.**



# National Methanol Standards

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- In March 2007, China's Committee on Standardization requested three methanol standards.
- High Proportion – M-70-M-85, now in final approval.
- Low Proportion – M-15, to be completed by June.
- Convertible Methanol Fuel – M-100 used in fuel blending, to be completed by June.



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

# DME: An Emerging Global Fuel

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- **Dimethyl ether ( $\text{CH}_3\text{OCH}_3$ ) is the simplest ether**
- **Burns like natural gas**
- **Handles like LPG (Liquefied Petroleum Gas)**
- **Made from methanol**
- **Very large market potential as synthetic LPG, diesel alternative and fuel for power generation**





# DME: Clean and Green

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- **HEALTH:**

- Used as propellant in personal care products for decades
- Low acute and chronic toxicity
- No human hazard relative to carcinogenicity, mutagenicity or teratogenicity within exposure limits



- **SAFETY**

- Thermally stable
- No tendency to peroxide formation found
- Flammable gas
- Compatible with all common metals
- Consider elastomer and plastic parts carefully
- Grounding and bonding procedures and equipment for dissipating static charge needs to be maintained



- **ENVIRONMENT**

- Does not deplete ozone
- Minimal impact on land/water due to volatility
- Low emission fuel (Diesel, LPG, Power)

Visit [www.aboutdme.org](http://www.aboutdme.org)

Extensive section on Health, Safety and Environment

# DME Transportation Fuels

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- **China plans to build 20 million tons of DME production capacity by 2020.**
- **Demonstrating DME-fueled buses, with fueling station in Shanghai.**
- **In Europe, Volvo has grant from Swedish government to build and demonstrate 19 DME-fueled trucks.**

# For More Information

Methanol Institute

- **[www.methanol.org](http://www.methanol.org)**
- **[gdolan@methanol.org](mailto:gdolan@methanol.org)**
- **1-888-275-0768**
- **(703) 248-3636**

