Methanol Industry Overview

Marc Alvarado, Associate Director – Syngas Chemicals
+1 (281) 752-3271 marc.alvarado@ihsmarkit.com
Contents

• IHS Markit
• Value Chain
• Feedstocks and Implications for Methanol
• Demand for Methanol
• Methanol Production
• Trade Shifts and Prices
• Conclusions
Every colleague is committed to putting Customers First

Our mission is to deliver a powerful combination of world-class expertise, knowledge and solutions so you can make more informed decisions to enable your organizations’ long-term, sustainable growth.

Including 5,000+ analysts, data scientists, financial experts and industry specialists who offer:

- Unsurpassed ability to interpret data
- Award-winning forecasting
- Relationships with industry leaders
Addressing strategic challenges with interconnected capabilities

We deliver on the promise of The New Intelligence

IHS Markit provides leaders from multiple industries with the perspective and insights you need to make the best choices and stay ahead of the competition.
Core Segments within Energy & Natural Resources

Our core capabilities serve our energy and chemical customers across the value chain through focused data and insight subscriptions as well as consulting.

UPSTREAM
- Country E&P Terms and Above-Ground Risk
- Plays and Basins
- Costs and Technology
- Companies and Transactions

OIL MIDSTREAM, DOWNSTREAM & CHEMICAL
- Crude Oil Markets
- Midstream Oil and Natural Gas Liquids
- Refining and Marketing
- Company Strategies and Performance
- Chemical Week and Market Daily Service
- Base Chemicals & Plastics
- Specialty Chemicals
- Costs & Technology
- Company Benchmarking & Analytics

POWER, GAS, COAL & RENEWABLES
- Global Gas
- Coal
- Power and Renewables
- Regional Gas, Power and Coal Markets

ENERGY-WIDE PERSPECTIVES
- Long-Term Planning & Scenarios
- Climate Strategy
- Curated Content
- Integrated Energy Events & CERAWeek
Chemical Product Portfolio - Information, Analytics, Expertise

**Base Chemical Insights**
- Aromatics & Fibers
- Chlor-Alkali & Vinyls
- Light Olefins & Derivatives
- Heavy C4 Olefins & Derivatives
- Plastics & Polymers
- Syngas Chemicals

**Specialty Chemical Insights**
- Industrial Gases & Fertilizers
- Inorganics & Mining Materials
- Intermediates, Fibers & Films
- Polymers & Elastomers
- Pure Specialties
- Renewables & Nutrition
- Resins & Coatings
- Solvents & Surfactants

**Technology & Analytics**
- Process Economics
- Competitive Cost and Margin Analytics
- Capital Costs Service
- Special Studies

**Business Information & Same-Day Analysis**
- Chemical Week
- Chemical Company Analysis
- Directory of Chemical Producers
- Market Daily Service
- Member Events

**Consulting Services**
- Strategy
- Commercial Analysis
- Transaction Support
- Technology Assessment
- Industry Training
Value Chain
Methanol Value Chain

Feedstocks
- Natural Gas
- Coal

Product
- Methanol

Derivatives
- Formaldehyde
- Acetic Acid
- MMA
- MTBE
- DME
- Gasoline
- MTO/MTP
- Biodiesel

Products/End Uses
- UF/PF Resins
- Polyacetics
- MDI
- VAM
- Acetate Esters
- Acetic Anhydride
- PTA
- Gasoline Additive
- Olefins
- Fuels

Sectors
- Construction
- Automotive
- Electronics
- Appliances
- Paints/Coatings
- Insulation
- Pharma
- Packaging (PET Bottles)
- Solvents
Feedstocks and Implications for Methanol
Methanol - Feedstocks

Global Methanol Feedstock Trend

- Nat.Gas/Lt.Gases
- Coal to Methanol
- Coking Gas
- Other

Source: IHS Markit

© 2017 IHS Markit
Global Crude Prices Recover as Oil S/D Balances Tighten
Chinese Coal not forecast to be volatile

China Coal vs. Crude Oil Pricing

Source: IHS Markit
Global Crude Prices Recover as Oil S/D Balances Tighten
US Natural Gas not forecast to be volatile

Global Crude Oil vs. USGC Natural Gas

Source: IHS Markit

© 2017 IHS Markit
Global Methanol Cost Curve – Plant Gate Cash Cost for 2021
Global Methanol Cost Curve – Plant Gate Cash Cost for 2021

Source: IHS Markit
What are the feedstock implications for methanol?

- The incremental ton of methanol will continue to be produced from coal in China (mostly 3rd and 4th quartile on the cost curve)

- The coal price will continue to be a major factor in determining the floor price of methanol in China

- The low cost of US natural gas will keep US methanol producers competitive (2nd quartile on the cost curve)

- Low production cost will result in further investment in methanol projects in certain markets
Demand for Methanol
2010 Global Methanol Demand: Chemicals and Energy End-Uses

World: 2010 Methanol Demand by End Use

- Formaldehyde: 34.0%
- Acetic Acid: 10.8%
- MTBE/TAME: 12.6%
- Methyl Methacrylate: 2.1%
- Gasoline Blending: 6.6%
- Biodiesel: 3.8%
- Dimethyl Ether: 9.6%
- Methylamines: 4.0%
- Chloromethanes: 3.8%
- Solvents: 5.6%
- Others/DMT: 7.0%

Demand = 49.3 Million Metric Tons

Source: IHS Markit

© 2017 IHS Markit
2021 Global Methanol Demand: The Importance of MTO – 1 in 5 tons of methanol

**World: 2021 Methanol Demand by End Use**

- **Formaldehyde**: 26.9%
- **Acetic Acid**: 8.3%
- **MTBE/TAME**: 9.7%
- **Methyl Methacrylate**: 1.6%
- **Gasoline Blending**: 8.5%
- **Biodiesel**: 3.5%
- **Dimethyl Ether**: 6.8%
- **Methylamines**: 2.7%
- **Chloromethanes**: 2.3%
- **Solvents**: 4.0%
- **MTO/MTP**: 19.3%
- **Others/DMT**: 6.3%
- **Methylamines**: 2.7%
- **Cloromethanes**: 2.3%

**Source**: IHS Markit

Demand = 95.2 Million Metric Tons
Global Methanol Demand by Region

Source: IHS Markit
Global Methanol Consumption Categories

Global Methanol Consumption

![Chart showing global methanol consumption categories from 2011 to 2026. The categories are traditional derivatives, MTO/MTP, and fuel. The data is sourced from IHS Markit.](chart_image)

Source: IHS Markit © 2017 IHS Markit
The Methanol Industry Is Entered Into A New Dimension With Much Larger MTO Plants

Capacity to consume methanol by key derivative in China (2017)

Source: IHS Markit

© 2017 IHS Markit
Ethylene Cash Cost Comparison

World Ethylene Cast Cost Comparison

US Dollar Per Metric Ton

- U.S. Ethane
- Western Canada
- China CTO
- Northeast Asia Naphtha
- West Europe Naphtha
- Southeast Asia Naphtha
- China MTO

2011
2016
2021

SAR @ $1.75/MMbtu

Source: IHS

Notes: CTO/MTO: Cash costs based on one ton of total olefin basis (50/50 ethylene/propylene)
Ethylene Cash Cost Comparison

World Ethylene Cast Cost Comparison

Source: IHS

Notes: CTO/MTO: Cash costs based on one ton of total olefin basis (50/50 ethylene/propylene)
Ethylene Cash Cost Comparison

World Ethylene Cast Cost Comparison

![Chart showing ethylene cash cost comparison across different regions and years.](chart)

Notes: CTO/MTO - Cash costs based on one ton of total olefin basis (50/50 ethylene/propylene)
Methanol in the Chinese Gasoline Pool

Methanol Values Into Direct Gasoline Blending

Source: IHS Markit

© 2017 IHS Markit
Methanol in the Chinese Gasoline Pool

Methanol Values Into Direct Gasoline Blending

- Equivalent volume price for methanol. One gallon methanol equals one gallon gasoline.
- Equivalent energy price for methanol.
- Forecast price range of gasoline, 2017.

Source: IHS Markit

© 2017 IHS Markit
Methanol in the Chinese Gasoline Pool

Methanol Values Into Direct Gasoline Blending

This gap makes illegal blending attractive, resulting in a portion of inelastic demand.
What are the demand implications for methanol?

• Steady GDP type growth is expected for the ‘traditional’ methanol derivatives

• The forecast increase in the crude oil price will lead to a steady rise in methanol prices – energy applications and MTO closely correlated to oil – however, this rise will be constrained over the next few years by the cost competitiveness of these options
Methanol Production
Methanol Operating Rates Can Be Misleading

Global Methanol Nameplate vs. Effective Capacity

Source: IHS Markit

© 2017 IHS Markit
Methanol Operating Rates Can Be Misleading

Global Methanol Nameplate vs. Effective Capacity

Source: IHS Markit  © 2017 IHS Markit
Methanol Operating Rates Can Be Misleading

Global Methanol Nameplate vs. Effective Capacity

Source: IHS Markit

© 2017 IHS Markit
Methanol Trade Shifts and Prices
Historical Regional Methanol Net Trade

- N America is a major net importer
- S America is a major net exporter
- W Europe is a major net importer
- Northeast Asia is a major net importer
- Middle East is a major net exporter
- Southeast Asia is a net exporter
- Northeast Asia is a major net importer
- Southeast Asia is a net exporter
Global Methanol Cost Curve – Plant Gate Cash Cost for 2021

World Cost Curve: Methanol

Source: IHS Markit

© 2017 IHS Markit
Global Methanol Cost Curve – Plant Gate Cash Cost for 2021

World Cost Curve: Methanol

Source: IHS Markit © 2017 IHS Markit
Global Methanol Price Mechanism: Middle East Netback

**NAM**
- ME price to North America = China price + Freight differential + Duties

**SAM**
- South American producers price to N. America at a price to discourage ME imports to N. America

**WEP**
- ME Price to Europe = China price + Freight differential + duties + handling
- W. European producers marginal cost may force upward adjustment

**NEA & SEA**
- Global marginal cost production block
- Global price setter

**ME**
- Global price taker
- Balances exports to regions for highest netback (NB)
- NB ME China = China price less freight ME to China
- Incremental cost to deliver to WE vs. China
- Incremental Cost to deliver to NA vs. China
Regional Methanol Net Trade - 2016 versus 2021

- **N America changes to large net export position**
  - 2016: -1419
  - 2021: 1530

- **S America becomes a larger net exporter**
  - 2016: 5713
  - 2021: 6576

- **W Europe becomes a larger net importer**
  - 2016: -4599
  - 2021: 10349

- **Middle East becomes a larger net exporter**
  - 2016: -5095
  - 2021: 14571

- **Northeast Asia becomes a larger net importer**
  - 2016: -13216
  - 2021: 2303

- **Southeast Asia becomes a smaller net exporter**
  - 2016: 39
  - 2021: 1975
Forecasted Global Methanol Price Mechanism: Producer Netback Balance

**NAM**
- North American price to be Asia less some function of freight
- Market balanced by exporting to Europe and Asia

**SAM**
- Exports to North America and Europe continue with Atlantic basin balance maintained by moving additional tons to Asia

**WEP**
- ME Price to Europe = China price + Freight differential + duties + handling

**ME**
- Global price taker
- Balances exports to regions for highest netback (NB)

**NEA & SEA**
- Remains global marginal cost production block
- Global price setter
Regional Methanol Price Comparison – Long Term

Methanol Annual Regional Price Comparison

Source: IHS Markit

© 2017 IHS Markit
Methanol vs Energy Products vs MTO Affordability

Equivalent Price for Energy Products and MTO for Asia
Methanol vs Energy Products vs MTO Affordability

Equivalent Price for Energy Products and MTO for Asia

Dollars per metric Ton


Methanol - Asia
Gasoline - NEA
Crude Oil - NEA
MTO Affordability
Conclusions
Conclusions

• Coal based production in Eastern China populates the fourth quartile of the cost curve and sets the methanol price as the incremental ton of production

• The spread between natural gas prices – as a methanol feedstock – and crude oil – as a basis for derivative affordability – is driving capacity additions in select geographies

• Global demand growth for methanol is at 4.3% AAGR from 2016 to 2026 versus GDP at 3.0%
  • MTO is a key driver at 9.7% during that time period

• Global operating rates are actually higher than what nameplate would suggest
  • There is an inability to raise rates further in certain locations

• Methanol is a fungible commodity with regional prices set by freight and duty differentials
  • The price mechanisms are likely to undergo a shift with changes in trade patterns

• Methanol prices are capped by MTO affordability
35th WORLD METHANOL CONFERENCE

• 29th – 30 September, 2017

• Berlin Pullman Hotel, Berlin, Germany

• Full day workshop "Introduction to Methanol" on September 29, 2017

• More about IHS World Methanol Conference at www.ihs.com/WMC2017