Methanol and DME from Natural Gas/
Usage of New Fuel DME

May 13th, 2010  Khabarovsk, Russia

Mitsubishi Gas Chemical Co., Inc.
MGC’s Profile

Key Facts

Incorporated in 1951

Employees: 4,686 (as of Mar 31, 2008 consolidated)

Consolidated Subsidiaries: 33 (as of Mar 31, 2008)

Paid-in capital: JPY42 BLN (as of Mar 31, 2008)

Net Sales: JPY519 BLN (USD5BLN): FY2007, consolidated
## MGC’s Division

### Natural Gas Chemicals Division
- **Commodity chemicals**: Methanol (DME), Ammonia, Formaldehyde
- **Organic chemicals**: Amines, Polyols, MMA
- **Energy Resources**: Exploration & Development for Gas & Oil, Geothermal
- **Others**: Biochemical, Technology Sales

### Aromatic Chemicals Division
- **Common Aromatic Chemicals**: Paraxylene, PTA, Phthalic anhydride, Orthoxylene, Plasticizers
- **Functional Aromatic Products**: MXDA, MX nylon, Aldehydes, Polycarbonic acid

### Specialty Chemicals Division
- **Inorganic Chemicals**: Hydrogen peroxide, Sodium hydrosulfide, Hydrazine hydrate, Persulfates
- **Engineering Plastics**: Polycarbonate, POM, m-PPE, Reny

### Information & Advanced Materials Division
- **Electronic Materials**: BT laminate, Epoxy laminate
- **Info-Advanced Materials**: Magnetic garnet single crystal
- **Oxygen Absorbers**: AGELESS, Anaeropac, RP systems
Outline of Natural Gas Chemicals Business

- First Company in Japan to synthesize Methanol (1952) and Ammonia (1957) from Natural Gas.
- AR-RAZI commenced commercial operation in 1983.
- METOR commenced commercial operation in 1994.
- Brunei will commence commercial operation in 2010.
- MGC has developed Businesses based on Natural Gas as follows.
  - Development of Natural Gas Resources in Niigata Prefecture Gas Field.
  - Expansion of methanol business overseas
  - Production of Derivatives derived from Methanol & Ammonia
  - Updated necessary functions to proceed with the Natural Gas Chemicals business
Methanol Business of MGC
Worldwide Networks

- MGC Europe
- Sulige (Inner Mongolia)
- MGC America
- MGC Head Office
- MGC Thailand
- MGC Singapore
- AR-RAZI
- AMPCO (Equatorial Guinea)
- BMC

- Tank Terminal
- Technology License
- MGC Sales Subsidiary
- J/V Company with MGC for producing Methanol

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MITSUBISHI PROCESS
World wide Methanol Plant

SAUDI ARABIA
AR-RAZI
I 620KTPA (Year 1983)
II 650KTPA (Year 1991)
III 850KTPA (Year 1997)
IV 850KTPA (Year 1999)
V 1,700KTPA (Year 2008)

Venezuela
METOR I 750KTPA (Year 1994)
METOR II 850KTPA (Year 2010)

China (Inner Mongolia)
180KTPA (Restart Year 2003)

Brunei
850KTPA (Year 2010)

Equatorial Guinea
850KTPA (Year 2001)

Subtotal 7,230,000 MT/Y
Total 8,320,000 MT/Y
(include Licensed Plants)
MITSUBISHI METHANOL PROCESS has the following advantages:

- **High Efficiency with Superconverter**
- **Less Operating Cost**
- **MGC Original High Performance Catalyst**

**Diagram Details:**
- **Natural Gas Feed Stock**
- **Hydro-Desulfurization**
- **Steam Reforming**
  - M. P. Steam
  - Fuel
  - H. P. Steam
- **Waste Heat Recovery**
  - Reformed Gas (H₂, CO, CO₂, CH₄)
  - Purge Gas for fuel
- **Compression Gas**
- **Distillation**
- **Synthesis**
- **Product Methanol**
  - Crude Methanol (CH₃OH, H₂O, DME)
Features of MGC’s Methanol Business

- Development of N. Gas
- Production Technology
- Diversification
- Manufacturing
- Logistics
- Catalyst
- Marketing
- Technical Service

Integrated Business Chain
What is DME (Di-Methyl Ether)?

- Multi-Use and Multi-Source energy
- Clean Energy (no Emission of SOx nor Particulate Matter (PM))
- Similar Characteristics to Liquefied Petroleum Gas (LPG)
  → Mixed with LPG up to 15-20wt%.
- High cetane number as diesel oil
  → Utilized for diesel engine.
DME Plant completed in Niigata, and Commercial Delivery Started

1st DME Promotion Plant in Japan

- Plant Site: Within MGC Niigata Factory
- Production: DME 80KT/Y using imported Methanol
- Production Start: August 2008
- Delivery Start: January 2009
Current Usage of Fuel DME

For Vehicle, Boiler and Agriculture

Development of DME Trucks for Public Road Test by Commercial Use in 17th Nov. 2009

First DME Boiler started commercial operation in 13th Jan. 2009

DME fuel used warming machine for the green house cultivation. Exhaust gas used to promote the plant.
ASIA DME CONFERENCE

16th-17th, Nov, 2011

in NIIGATA, JAPAN
Thank you

Mitsubishi Gas Chemical Company, Inc.

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Fuel DME HP
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