DME Industry and Association Overview

Jean-Alain Taupy
IDA Chairman
4th International DME Conference
Stockholm
The DME Industry – Entering its 2nd Decade

4th IDA Meeting
2002 Copenhagen

6th IDA Meeting
2003 Phoenix

7th IDA Meeting
2005 – Stockholm

DME Seminar
2006 – London

DME 1
2004 Paris

DME 2
2006 London

DME 3
2008 Shanghai

DME 4
2010 Stockholm
The DME Industry – Development Milestones

1963
- First use as an aerosol propellant (Akzo Nobel)

1994
- First demonstration projects launched (China, Japan)

1996
- Use as diesel fuel established (AVL List, BP, Haldor Topsoe, McCandless, Navistar)
- Japan DME Forum (JDF) established

2001
- IDA established
- First commercial production for energy use (Lutianhua Group, Toyo Engineering)

2003
- ISO standardization initiative launched

2007
- BioDME production begins (Chemrec)

2009
- China DME Association (CDA) established

2010
- First use as diesel fuel established (AVL List, BP, Haldor Topsoe, McCandless, Navistar)
The DME Industry – Capacity & Production Milestones

- 2003: 30 KTPY
- 2004: 40 KTPY
- 2006: 480 KTPY
- 2007: 2.2 MTPY
- 2008: 4.4 MTPY
- 2009: 5 MTPY
- 2010: 6, 7 MTPY
- 2015-18: 10-15 MTPY

Forecast
Fuel DME Market –
Project Overview - Global

**Sweden**
World’s first bioDME plant operational

**Egypt**
200 ktpy planned

**India**
265 ktpy planned

**Uzbekistan**
100 ktpy planned in 2013

**Saudi Arabia**
Project planned by Kogas (300 ktpy in 2013)

**Vietnam**
Project announced in March 2010

**China**
- 6,700 ktpy capacity (by March 2010)
- 600 ktpy under construction
- 20,000 ktpy planned by 2015-2018

**Japan**
80 KTPY operational

**Indonesia**
800 ktpy planned in 2011
DME Market – Project Overview - China

<table>
<thead>
<tr>
<th>China DME (KMT)</th>
<th>Q2 ‘09</th>
<th>Q2 ‘10</th>
</tr>
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<tbody>
<tr>
<td>Nameplate Capacity</td>
<td>6,800</td>
<td>7,600</td>
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<tr>
<td>Realistic Capacity</td>
<td>5,000</td>
<td>5,200</td>
</tr>
<tr>
<td>Quarterly Production</td>
<td>313</td>
<td>528</td>
</tr>
<tr>
<td>Op. Rates</td>
<td>25%</td>
<td>41%</td>
</tr>
</tbody>
</table>

Operating rates highest in E & S China (>45%)

Lower Operating rates in inland China (<30%)
Factors Driving Growth
More than 70% of DME currently produced is blended with LPG

- Blending ~20% DME / 80% LPG
- Model works best in countries that
  - Import LPG
  - Have local feed stocks to product DME
- Largest market is China (6+MMTPY installed capacity) but regulations & standards must be put in place and applied.
- Major companies in Egypt, India, Indonesia and Vietnam preparing to enter this market
Factors Driving DME Fuels Growth –
DME / LPG Blending

Strategic Considerations

- Energy security
- Clean fuel demand
- Reduced oil product demand / price
- Impact on balance of payments for LPG importing nations
- Energy delivery to remote areas without large capital investment in infrastructure
Profitability Considerations

- Cost of feedstock and LPG prices
- DME efficiency benefits
- Relatively low capital cost
- Proven technology
- Rural area gas bottling opportunities (niche/local markets)
Factors Driving DME Fuels Growth – Diesel Substitution

Opportunities

- Can be used in conventional diesel engines with a modified fuel injection system
- Large potential market
- High cetane
- Quiet combustion
- Clean burning (sootless – no smoke or particulates)
- 100% SOx reduction

Challenges

- Technical and regulatory hurdles remain
- LPG-like distribution infrastructure
- Lower lubricity requires lubricating agent
- Lower viscosity can cause leakage
- Government regulations
Factors Driving DME Fuels Growth – Diesel Substitution

Much Work Underway

- Japan DME Vehicle Promotion Committee
- Volvo & BioDME Consortium
- Shanghai Automotive Corp.
- Alternative Engine Technology
- Isuzu Advanced Engineering Center
- Nissan

Volvo DME Diesel Engine

SAIC DME Diesel Engine  
Isuzu DME Diesel Truck  
Nissan NTSL DME Diesel Truck  
SAIC DME Diesel Bus
Factors Driving Growth – Chemical Intermediate & Niches Applications

**Very Attractive Chemical Feedstock**

- Behaves as liquid synthesis gas – may be used in production of:
  - Ammonia
  - Acetic acid and anhydride
  - Short olefins (MTO)
  - Synthesis gas (H₂/CO/CO₂ mixture)
  - Hydrogen
  - Synthetic gasoline

**New Markets Appearing**

- Up to 10% of China production used for welding, cutting and brazing applications
Mission and Objectives

- Serve as the global voice of the DME industry and promote public awareness
- Provide a platform for international contact and unified action
- Monitor and communicate global DME developments
- Advocacy and stewardship
- Guide development, address obstacles to market penetration

IDA Executive Committee
China - 2008
The IDA unites those companies most active in the development of DME worldwide, from every sector of the industry, representing a wide range of interests within both the upstream and downstream value chains:

Isuzu Advanced Engineering Center
Alternative Fuel Technologies
Korea Gas Corporation
Haldor Topsøe
Lurgi
PT Arrtu Mega Energie
Methanex
SHV
Chemrec
Akzo Nobel
Posten Logistik

ENN
Indian Oil Corporation
Eni
China Energy
Total
Volvo
Range Fuels
Chemical Market Associates
City of Vaxjo, Sweden
Genifuel
Indian Oil Safety Directorate

and many more…
The IDA maintains close ties with regional DME association and related industry bodies, uniting those organizations most active in the development of DME worldwide:
## About the Association

### Organization and Governance

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<th>Chairman</th>
<th>Representation</th>
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<tr>
<td><strong>Government Affairs</strong></td>
<td>Chairman: Johan Torsell (Vaxjo)</td>
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<tr>
<td><strong>Health, Safety &amp; Environment</strong></td>
<td>Chairman: Henrik Landalv (Volvo)</td>
<td></td>
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<td><strong>Strategy</strong></td>
<td>Chairman: Ben Iosefa (Methanex)</td>
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<tr>
<td><strong>Research &amp; Development</strong></td>
<td>Chairman: Shuichi Kajitani (Ibaraki Univ.)</td>
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<tr>
<td><strong>Standards &amp; Regulations</strong></td>
<td>Chairman: François Bollon (Total)</td>
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### Regional Committees

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<th>Region</th>
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<td><strong>European Affairs</strong></td>
<td>Chairman: Ulrik Federspiel (Haldor Topsoe)</td>
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<td><strong>Indian Affairs</strong></td>
<td>Chairman: B.M. Bansal (Indian Oil)</td>
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<td><strong>North American Affairs</strong></td>
<td>Chairman: Jim McCandless (Alternative Fuel Technology)</td>
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<tr>
<td><strong>China Affairs</strong></td>
<td>Chairman: Huang Zhen (SJT University)</td>
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<tr>
<td><strong>Japan Affairs</strong></td>
<td>Chairman: Yotaro Ohno (RenFuD)</td>
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<tr>
<td><strong>Korea Affairs</strong></td>
<td>Chairman: Gye Lim (Hoseo University)</td>
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About the Association –
North American Affairs Committee

- Launched 2009 in Miami
- Objectives:
  - To certify DME as a fuel compliant with U.S. EPA and DOE requirements
  - To raise awareness among policymakers, facilitating eligibility for government fleet demonstration funding and activities
- Strategy:
  - Collaboration between U.S.-based companies and laboratories
  - Use information available from non-U.S. entities where possible
- Markets
  - Automotive fuel
  - “Green” LPG
  - Military fuel applications
Launched this week in Stockholm

Objectives:
- To raise awareness among EU policymakers, facilitating eligibility for government funding

Strategy:
- Work focused on working with DME “champions” in Brussels
- Leverage work done to date throughout Europe

Markets
- LPG substitution
- Transportation
About the Association –
Indian Affairs Committee

- Launched 2009 in Goa
- Objectives:
  - Creation of a 200 TPD methanol-to-DME plant in India
  - To raise awareness among policymakers, facilitating eligibility for government funding
- Strategy:
  - Work focused in four sub-groups
    - I. Technical & Economic Feasibility
    - II. Marketing & Commercial
    - III. R&D, Blending & Transportation
    - IV. Legal & Regulatory
  - Leverage work done to date in neighboring regions
- Markets
  - LPG substitution
  - Transportation
About the Association – Health, Safety & Environment Committee

- Met this week in Stockholm
- Objectives:
  - Facilitate HSE initiatives
  - Promote compliance and preparedness for all matters related to HSE
  - Lead product stewardship
- Strategy:
  - Facilitate information sharing
    - Leverage existing documentation
      - Japan DME Data Set translated into English
      - Japan LPG Center DME Blend Report to be translated into English
  - Identify and prioritize gaps in knowledge or information
  - Share or produce information of value to members and industry
    - DME Incident Log
    - 2 year activity plan
About the Association – Research & Development Committee

- Met this week in Stockholm
- Objectives:
  - Provide high level review, analysis, and recommendations for R&D initiatives and direction
  - Identify where most critical challenges are
- Strategy:
  - Review existing and new work
  - Facilitate information sharing in support of other initiatives (e.g. regulatory and HSE matters)
  - Identify work of possible interest to members
  - Highlight gaps where research or funding may be best directed
About the Association –
Regulations & Standards Committee

- Launched in 2009

- Objectives
  - Follow-up of the regulations and standards (R&S) about DME worldwide
  - Recommendations & support to people in charge of R&S

- Strategy
  - Follow up of the ISO work about DME standardization
  - Questionnaires for survey about R&S

- Market
  - LPG/DME blends for heating fuel
  - DME as replacement of diesel
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IDA Chairman
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