Global DME Developments: Progress, Opportunities and Challenges

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Outline

This presentation will address the “what, who, where, when and why” of global DME commercialization activities, with focus on the DME market as a LPG blend stock and the challenges competing in global fuel markets.

- About DME
- Challenges/Opportunities in Fuel Markets
- Global DME Developments
- Key Messages

About DME

About DME

Overview

- Burns like natural gas
- Handles like LPG
- Methanol derivative

$2\ CH_3OH \rightarrow CH_3OCH_3 + H_2O$

1.4 MT methanol → 1 MT DME

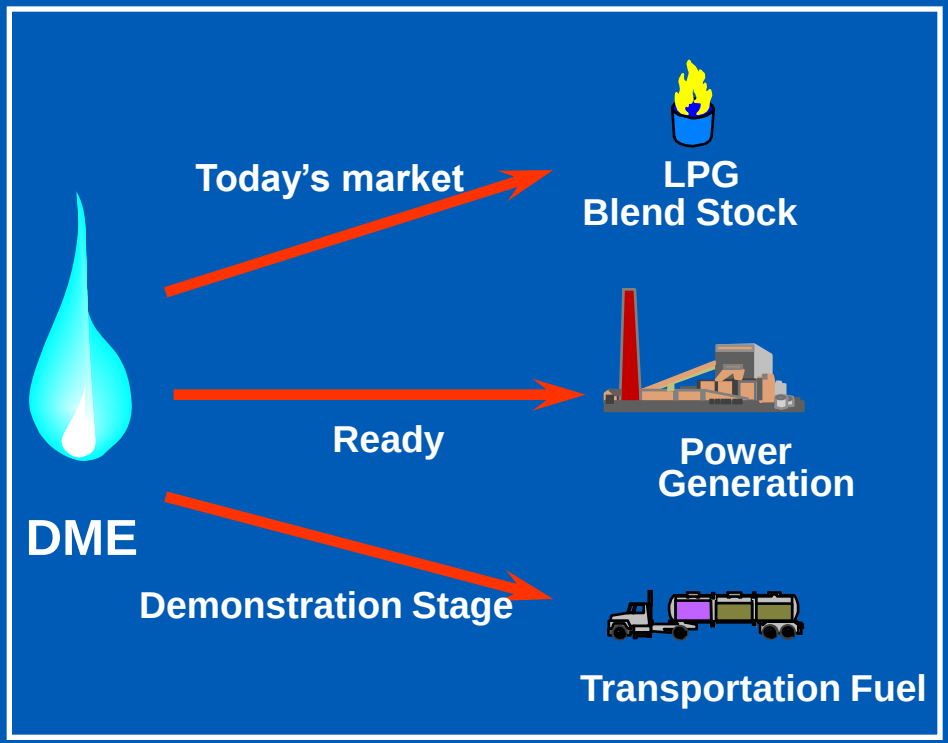
$R_1\text{-}OH + R_2\text{-}OH = R_1\text{-}O\text{-}R_2 + H_2O$

- Environmentally friendly with significant global consumer history as propellant
- Large market potential as LPG blend stock, diesel alternative and fuel for power generation

DME Markets

CFC Replacement

Three Major Fuel Applications



Challenges/Opportunities in Fuel Markets

Perspectives

The worldwide methanol market is changing due its use in fuel markets including conversion into DME (LPG blend stock), particularly in Asia.

In fuel markets, DME and methanol are “synthetic fuels” (XTP*) with a relatively high cost structure.

* XTP = conversion of hydrocarbons (e.g. natural gas and coal) to fuels

Economic Lessons Learned from XTP Projects

…….to better understand global DME developments over the past year.

- Natural gas/coal-derived fuels need to be economically attractive compared to conventional fuels derived from crude oil.
- Crude oil prices are volatile.
- Economies of scale for plants necessary for low-cost product
- Natural gas-derived fuels are less expensive than coal-derived fuels.
- XTP operations generally have been vertically integrated from gas/coal feedstock to finished product, including product marketing.

DME / LPG Blending – Factors Driving Growth

More than 80% 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 (5+MMTPY installed capacity)
- Major companies in Egypt, Indonesia and India preparing to enter this market

So: International DME Association, 9/2009

Let's look at the global LPG market to understand the DME prospects for significant near-term growth

•LPG demand in Asia is expanding fairly quickly--Driven by the growth in developing res/com markets *.

•LPG demand growth in the largest market sector (Res/Com) is influenced by several factors including access to supply, product pricing and affordability*.

•Projected LPG demand (2012) in Res/Com markets*:
135 million MT in world including:

- 60 million MT in Asia
- 17 and 15 million MT in North America and Europe, respectively

Potential DME Market in Asia as LPG blend stock about 15 million MT ** based on 2012 LPG demand

* Purvin & Gertz, Sept. 2008
* *20 vol% DME = 25 wt% DME; lower energy content of DME not accounted for.

Diesel Substitution - Factors Driving Growth

Opportunities

- Can be used in conventional diesel engines with a modified fuel injection system
- High cetane, and quiet combustion
- Clean burning: sootless – no smoke or particulates, 100% SOx reduction
- Market potential is very large

Challenges

- Technical and regulatory hurdles remain
- Lower lubricity requires lubricating agent
- Lower viscosity can cause leakage
- Large volume vehicle production
- LPG-like distribution infrastructure

Much Work Underway

Volvo DME Truck

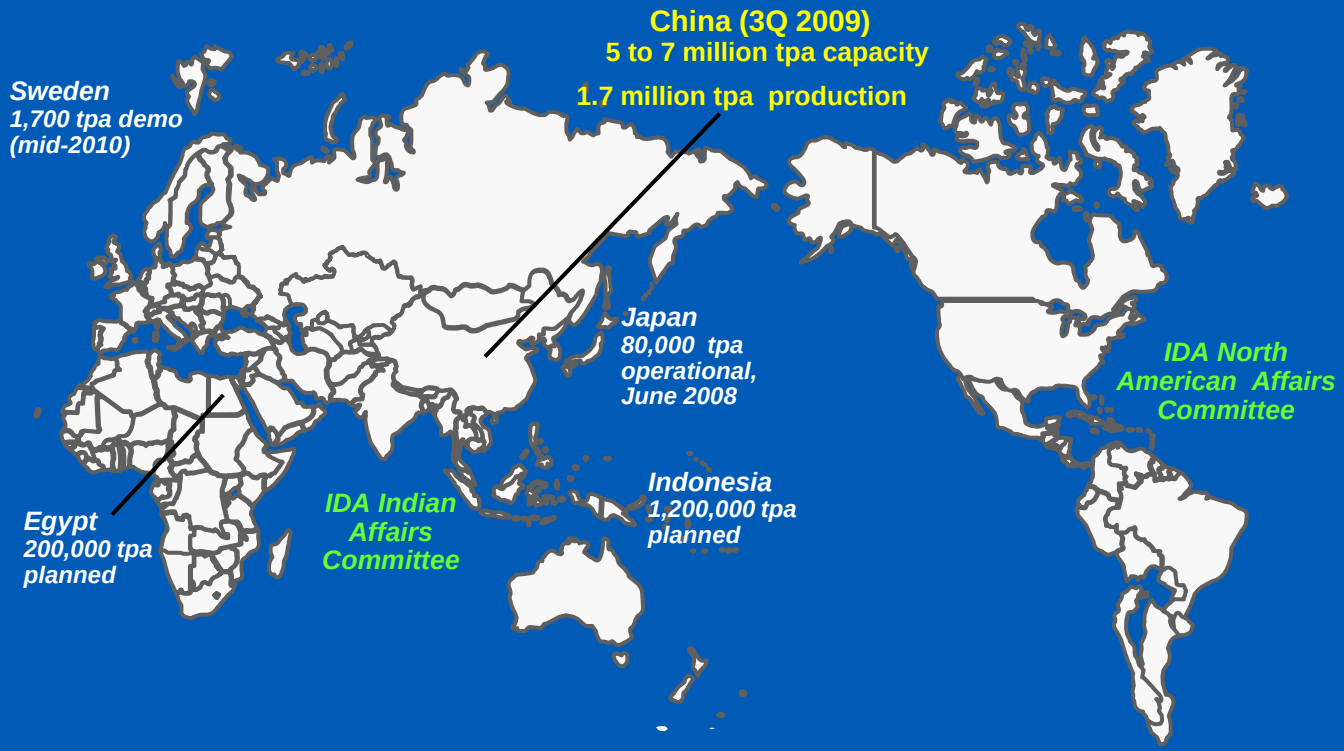
Nissan NTSL DME Diesel Truck

SJTU DME Diesel Bus

So: International DME Association, 9/2009

Global DME Developments

DME Projects and Developments Highlights



DME in China

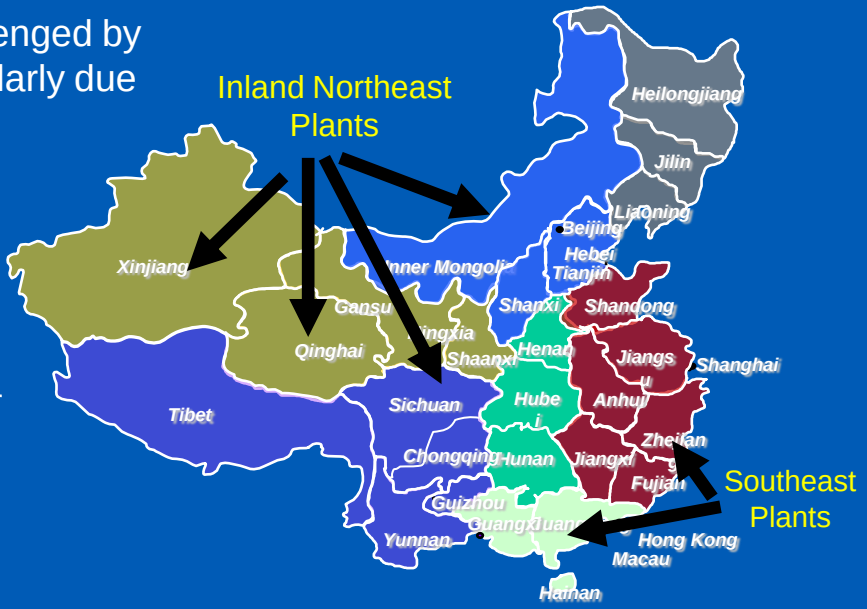
• Market has grown dramatically from 20,000 tpa in 2002 to almost 2 million tpa today, primarily as LPG blend stock.

• Many companies rapidly gaining production (primarily from coal), distribution and marketing experience.

• In past year, DME industry challenged by global economic downturn particularly due to lower crude oil prices.

•Operating rates low, with estimates varying from 25 to 35% avg. (3Q 2009)

•Plants in southeast operating at higher rates than those inland northeast.



IDA North American Affairs Committee

- Launched 2009
- 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
- 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

So: IDA, Sept. 2009

IDA Indian Affairs Committee

- Launched 2009
- 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

So: IDA, Sept. 2009

4th International DME Conference (DME 4)

Save the Date

6 – 9 September 2010
Stockholm, Sweden

www.aboutdme.org

Key Messages

- Significant progress has been made in the past 15 years in understanding and advancing the DME business.
- While LPG blending is already a significant market and has large potential growth ahead, the most significant potential market is for diesel substitution.
- In fuel markets:
  - DME value chain needs to be economically competitive with petroleum-derived fuels.
  - DME is a “synthetic fuel” with a relatively high cost structure.

DME has become a commercial reality and is the fastest growing methanol derivative.

Acknowledgments and Disclaimer

Acknowledgments

Ronald A. Sills LLC gratefully acknowledges the significant information provided by others used in this presentation, particularly by the International DME Association and its members.

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Questions

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