DME from Natural Gas or Biomass: A Better Fuel Alternative

Anthony Greszler
Volvo Group Truck Technology
DME Background - What is DME?

1.4 tons MeOH to 1 ton DME
DME - WHY?

- Excellent diesel cycle fuel (high cetane)
- Easy to store and transport (liquefies at low pressure & no venting)
- Clean (near zero soot) combustion (no DPF)
- Cost Effective
- High well-to-wheel efficiency
- Low Global Warming Potential
  - GWP = 1.2 @ 20 yr; .3 @100 yr
- Synthesis from variety bio based feedstocks
  - High biomass to fuel conversion efficiency
- Synthesis from natural gas
- Power density for long-haul
- Non toxic
DME – What’s Changing?

- Higher cost of diesel since 2008
- Abundance of natural gas at low cost in US
  - Readily available feedstock for DME
  - DME from NG: cost effective vs. diesel
- DME as transport fuel in ongoing field test
  - Bio-DME produced from paper mill residue
  - DME infrastructure with four filling stations
  - Field test at customers with 10 class 8 trucks
- Increasing interest from fuel suppliers
Demonstration Project- 10 Trucks, 1M km

Feedstock- Black Liquor from paper mill

Bio DME 4 t/day
Fuel distribution

- Available technology modified for DME
- Safety regulations based on LPG
- Low cost, ~200 k€ per filling station
- Easy to achieve
DME Vehicle technology

- Diesel base engine unchanged
- Diesel cycle efficiency preserved
- New fuel system
- No soot no DPF
- NOx control possible via SCR or heavy EGR
- Modified engine control software
- DME compatible materials where needed
Natural/Bio Gas Thermo-Chemical Conversion

- **Natural GAS**
- **BIO GAS**
- **Ammonia Urea**
- **Fisher Tropsch**
- **DME**
- **Diesel Hydrocarbons Lubricants**
- **Methanol**

Production Processes

Under R & D
Why Convert NG to DME?

Vehicle
- Low cost fuel tanks
- No DPF
- Longer driving range
- Potentially lower cost than diesel vehicle at high volume

Distribution Infrastructure
- No high pressure gas or cryogenic liquid
- Low cost, stable, long-term storage (no boil-off)
- Low cost fueling stations (like LPG)
- Transportation via low-cost tankers
- Potential for smaller, affordable production plants near feedstock and/or users

Total Operating Coast
- Diesel cycle fuel efficiency (potentially better than diesel)
- Fuel cost potential less than diesel (NG or biogas feedstock)

Environment
- No smoke
- Low Global Warming Potential and No boil-off
- Petroleum use reduction
Actions Needed to Move Forward

Engine Development
• Combustion optimization
• Emission development and certification
• Component refinement and cost
• Reliability and durability demonstration

Fuel Infrastructure
• Fuel certification
• Infrastructure build out starting with dedicated and regional fleets
• Process refinement: efficiency & cost
DME Summary

- Excellent environmental properties
- Energy efficient
- Cost efficient
- Global potential for diesel replacement (gasification of biomass or NG)
- Technology demonstrated
- Energy carrier for the future

The time is right and the opportunity is here!

Thank you!