



### Introduction

DME is one of the most promising alternative automotive fuel solutions among the various ultra clean, renewable, and low-carbon fuels under consideration worldwide. DME can be used as fuel in diesel engines, gasoline engines (30% DME / 70% LPG), and gas turbines. Only modest modifications are required to convert a diesel engine to run on DME, and engine and vehicle manufacturers, including Isuzu, Nissan, Shanghai Diesel and Volvo, have developed heavy vehicles running on diesel engines fueled with DME.



It is as a replacement for diesel fuel that DME particularly demonstrates its most distinct advantages.

### Benefits

As an automotive fuel, when compared with petroleum-derived diesel, DME's performance demonstrates a number of significant benefits that are driving interest by major industry players:

- **Multi-source and multi-purpose fuel**
- **Ultra low exhaust emissions**
- **Low CO<sub>2</sub> emissions**
- **Low engine noise**
- **High fuel economy**
- **High well-to-wheel efficiency**
- **Thermal efficiency better than diesel**
- **Ignition characteristics better than diesel**
- **Higher energy conversion than synthetic F-T diesel**
- **Highest land use efficiency of any renewable fuel**

The reduction or elimination of particulate emissions, also commonly known as soot or black smoke, is another important benefit. Diesel engines running on 100% DME exhibit smoke-free combustion, while engines using a DME/diesel fuel blend demonstrate significant reduction of soot.

A high cetane rating of 55 – 60 (compared to about 45 for petroleum-derived diesel) and a boiling point of -25°C provide fast fuel/air mixing, reduced ignition delay and excellent cold starting properties – two additional key advantages for DME's use as an automotive fuel.

### Technical Characteristics

DME has physical properties similar to LPG, but different thermal properties:

Properties		DME	LPG
Vapor Pressure	<i>kPA</i>	530	520
Liquid Density	<i>kg/m<sup>3</sup></i>	667	540
Heating Value	<i>MJ/kg</i>	28.8	46
Bottle Fill	<i>%</i>	85	80
Mass per Bottle Unit Vol.	<i>kg/m<sup>3</sup></i>	567	432
Energy per Bottle Unit Vol.	<i>GJ/m<sup>3</sup></i>	16.3	19.9

### Reliability and Performance

Results from trials in Asia and Europe on 3<sup>rd</sup> generation DME fueled vehicles are providing further proof of DME's performance and reliability of engines running on the fuel. Heavy duty DME-fueled vehicles have completed 100,000 km. trials in Japan, one of Shanghai's bus routes uses buses running on DME, while in Europe the EU-funded BioDME project involved a fleet of Volvo trucks running on DME made from renewable feedstock – a demonstration involving the entire well-to-wheel chain. The results of these trials have demonstrated that DME is ready for wider use in trucks and other fleet vehicles.



### Standardization & Infrastructure

International standards related to the use of DME are anticipated from the International Organization for Standardization (ISO) in 2014.

Industry leaders, in coordination with the ISO DME working group, are working to define acceptable levels of fuel impurities, testing additives for improved fuel lubricity, evaluating DME's impact on engine lube oil durability, and standards for DME dispenser configuration in anticipation of wider introduction of the fuel to diesel fleet operations.



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