Volvo Bio-DME

Unique field test in commercial operations, 2010–2012
Volvo Trucks is the first truck manufacturer to carry out comprehensive customer-based field tests involving Bio-DME fuel – and continues to lead in the development of sustainable road transport.

In August 2007, Volvo Trucks unveiled no less than seven demonstrator trucks each tailored to run on different types of biofuel. The project showed that Volvo has the technical solutions for running the efficient diesel engine on virtually all available renewable fuels.

The challenge lies in getting society and industry to agree and work together with a long-term perspective. It also requires sufficient quantities of biofuel that offers adequate energy content and efficient land utilisation.

Bio-DME – strong properties
DME produced from biomass is known as Bio-DME. It offers high energy efficiency and produces low levels of greenhouse emissions from well to wheel. In addition, DME has combustion properties that make it an ideal fuel for diesel engines.

“This from a holistic point of view, DME is one of the most promising second-generation biofuels. The Bio-DME project creates exciting new possibilities for testing DME in realistic conditions among our regular customers.”

Lars Mårtensson, Director Environmental Affairs at Volvo Trucks

This is DME
DME (Di-Methyl-Ether) is a gas but is converted into liquid form at low pressure. It is simple to handle in a process similar to that required for liquefied petroleum gas (LPG). Today the most common use is as a propellant in spray-cans. DME can be produced from any organic source including various forms of biomass. From an EU perspective, by 2030 Bio-DME has the potential for replacing more than 50 %* of today’s diesel usage in heavy road transport.

Environmental facts, Bio-DME
- 95 % lower carbon dioxide emissions than diesel, no soot particulate emissions
- Five times better land usage than for biodiesel, for example
- High energy-efficiency in relation to other biofuels

*Source: EUCAR/CONCAWE/JRC 2005, European Commission, Volvo

Climate impact

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Volvo’s DME truck uses a regular D13 engine which, after some modification of the tank system, injection system and engine management, functions perfectly together with the biofuel.

**Better combustion, lower emissions**
DME as a fuel in a diesel engine provides as high efficiency rating and a somewhat lower noise level compared with a traditional engine. The combustion process produces very low emissions of particulates and NOx. Therefore, a simpler system can be used for after-treatment of the exhaust gases. The engine can also provide higher torque at start-up and thus improve driveability.

**Modifications to suit the fuel system**
DME is filled in liquid form and stored in pressurised tanks in a leak-proof system. The pressure keeps the fuel in liquid form all the way to injection. Common rail technology is used to create the optimum injection pressure. The energy content of DME, approximately 55 % that of diesel, is compensated through the installation of larger tanks.

**Regional traffic in focus**
In the field test, Volvo is choosing to focus on heavy trucks running in regional operations, vehicles that return to the same location for refuelling. The relatively high fuel consumption of these operations will provide a suitable basis for effective testing of both the fuel itself and the technology involved. The environmental gains will also be greater.
“Behind the wheel, it’s business as usual. Performance and driving properties are just as good as in the diesel variant. The difference – and the major benefit of DME – is to be found in the low CO₂ emissions.”

Mats Franzén,
Engine Manager, Product Strategy and Planning at Volvo Trucks
THE BIO-DME PROJECT
- FROM WOOD TO WHEEL

In 2009, a unique cooperative venture between the European Commission, the Swedish Energy Agency, fuel companies and transport industry, among others, gets under way. Working together, the project partners will investigate the potential for full-scale investment in Bio-DME as a vehicle fuel.

5 tonnes of Bio-DME a day
The hub of the project is the energy technology company Chemrec’s pilot plant for DME production in Piteå in northern Sweden. In a unit built alongside its pulp-production facility, Smurfit Kappa Kraftliner, Chemrec will produce five tonnes of Bio-DME per day.

The raw material used is black liquor – an energy-rich, highly viscous by-product of the pulp industry. Gasification of the black liquor generates a very clean and energy-efficient fuel. The energy content of the black liquor, which today is used by the pulp plant, is replaced with other biomass sources.

Bio-DME potential in Sweden
If all black liquor in Sweden is used for the production of Bio-DME, this would replace 50% of today’s diesel usage for road transport.

14 trucks in field tests
Volvo is leading the project and is building 14 trucks to run on Bio-DME that will be used in field operations by selected customers in various parts of Sweden. Preem will build fuel stations so that the trucks can be used in normal regional and local operations.

Inspections and evaluations of the fuel, truck technology, customer perceptions and distribution system will provide answers as to whether Bio-DME can partially reduce the need for fossil fuels – as many experts believe is the case.

Facts, Bio-DME project

- Total project duration: 2008–2012. Field tests carried out between 2010 and 2012
- Chemrec and Haldor Topsoe will develop and build a DME plant in Piteå
- Volvo Trucks will develop and build 14 DME trucks and design a fuel injection system together with Delphi
- ETC, the Energy Technology Centre in Piteå, contributes its technical expertise
- Preem is responsible for Bio-DME distribution to 4 fuel stations in Sweden
- Total is responsible for fuel and lubricant specifications
- The project is financed by the participants, the EU and the Swedish Energy Agency