MAN B&W ME-GI
Dual-fuel, low-speed engine

Engineering the Future – since 1758.
MAN Diesel & Turbo
Based on mature, versatile, low-emission technology, MAN Diesel & Turbo’s dual-fuel ME-GI concept has been readily adopted by the marine market. Capable of operation on gas and/or GFO, this innovative engine’s order book is growing and includes such different applications as container ships, bulk carriers, ConRo vessels, and LPG and LNG carriers. The ME-GI represents a highly efficient and flexible propulsion plant solution.

The GI designation indicates that this engine is a modification of the ME version of the low-speed MAN B&W engine. This essentially means that this system is electronically controlled, which simplifies the -GI design, minimises the cost of the dual-fuel engine and provides the system with a large degree of adaptability and flexibility for meeting future emission regulations. Basically, the ME-GI is an ME engine with a gas injection system added.
Benefits
MAN B&W ME-GI

- Highest thermal efficiency of any system on the market for propulsion of LNG carriers.
- Burns gas without creating methane slip and formaldehydes.
- Flexible burning of HFO/GO/DO and gas – any HFO/gas ratio can be burned once a small amount of fuel oil is injected to ignite the gas.
- A wide range of gas qualities can be employed since there is no requirement for the methane number.
- Uses conventional two-stroke MAN B&W engine technology with its inherent high reliability, low maintenance and simplicity.
- The diesel combustion principle eliminates the risk of knocking, and gives a more stable combustion without pressure fluctuations.
- Can be retrofitted on existing ME, ME-B and ME-C engines.
- Reduced CO₂, NOₓ and SOₓ and particulate emissions when operating in gas mode.
- Can operate in conjunction with a waste heat recovery system.
- Maintenance of both GI and gas supply systems can be done by the crew or by PrimeServ.
- Optimal engine layout and operation profile coordinated with gas fuel equipment suppliers.
- Able to meet Tier III, when combined with the EGR (exhaust gas recirculation) or the SCR system.

Engine Programme
MAN B&W ME-GI

All ME/ME-C engines can be delivered as dual-fuel ME-GI gas engines – typical performance data for the most relevant types are shown below.

Tier II MAN B&W ME-GI medium bore engines – principal data (L1)

<table>
<thead>
<tr>
<th>Engine Type</th>
<th>Cyl. no.</th>
<th>Bore (mm)</th>
<th>Stroke (mm)</th>
<th>MEP (bar)</th>
<th>Engine speed (r/min)</th>
<th>Mean piston speed (m/s)</th>
<th>Power (kW)</th>
<th>Gas fuel – SFOC (g/kWh)</th>
<th>Liquid fuel – SFOC (g/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G50ME-C9-GI</td>
<td>5-9</td>
<td>500</td>
<td>2,500</td>
<td>21.0</td>
<td>100</td>
<td>8.3</td>
<td>8,600</td>
<td>167</td>
<td>168</td>
</tr>
<tr>
<td>S70ME-C10-GI</td>
<td>5-8</td>
<td>700</td>
<td>2,800</td>
<td>21.0</td>
<td>91</td>
<td>8.5</td>
<td>17,150</td>
<td>168</td>
<td>168</td>
</tr>
<tr>
<td>S80ME-C9-GI</td>
<td>6-9</td>
<td>800</td>
<td>3,450</td>
<td>20.0</td>
<td>78</td>
<td>9.0</td>
<td>27,060</td>
<td>168</td>
<td>168</td>
</tr>
</tbody>
</table>

Specific gas consumption consists of 5% pilot liquid fuel and gas fuel. Gas fuel LCV (30,000 kJ/kg) is converted to diesel fuel LCV (42,700 kJ/kg) for comparison.
Applications, Emissions and Future Possibilities
MAN B&W ME-GI

Winning the order for a gas-burning two-stroke engine aboard an LNG carrier was a market breakthrough for low-speed diesel engines and has opened the door for basically all types of ships.

Since the confirmation of the very first order for an ME-GI unit, MAN Diesel & Turbo’s order book has filled up, confirming the market acceptance of this innovative engine. The number of applications that the ME-GI engine has been ordered for has subsequently increased to encompass almost all ship segments.

The dual-fuel ME-GI engines also offer new possibilities within the stationary market, producing clean power that meets all known emissions regulations.

The first ME-GI unit has successfully passed its official trial run in the presence of the shipowner, shipyard, and classification society representatives, and more than 35 dual-fuel engines have been delivered at the time of writing.

The ME-GI fuel gas supply system (FGSS), operating at a pressure of 300 bar, complies with all regulations and restrictions. The FGSS design fits several different LNG tank systems and has been successfully verified to be able to operate in accordance with strict safety level and engine operation requirements.

In terms of emissions, a cleaner system is achieved when powering the engine on gas instead of HFO. Only negligible amounts of sulphur oxides can be traced in the exhaust gas. Particulate amounts are also reduced considerably as are NOx and CO2 levels.

The ME-GI is designed to meet future emissions requirements as the combustion of gas does not generate any methane or formaldehydes. Methane is a greenhouse gas which is 36 to 86 times worse than CO2 according to IPCC. With gas burned in the ME-GI engine, the global warming potential is reduced by some 10-20% at any engine load down to 10%. No other engine combustion technology offers the same benefit.

The ME-GI engine represents the culmination of many years’ work. Depending on relative price and availability, as well as environmental considerations, the ME-GI engine gives shipowners and operators the option of using either HFO or gas – predominantly natural gas. An ME-LGI counterpart is also being developed that uses LPG, methanol and other environmentally-friendly liquid fuels.