Global Value Chain of large Marine Diesel Engines

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MAN Diesel & Turbo, Denmark
MAN Group – Part of the VW group

Key Figures 2012

MAN Group 2012
Revenue €15.8 billion, 54,283 Employees
Operating profit €964 million, Return on sales 6.1%

Commercial Vehicles

MAN Truck & Bus
Revenue 12: €8.82 bn

MAN Latin America
Revenue 12: €2.87 bn

Power Engineering

MAN Diesel & Turbo
Revenue 12: €3.78 bn

Investments: Sinotruk (25.0% + 1 share), Scania (17.4%)

RENK
(76 %)
Revenue 12: €476 mn
## Organizational Structure

### Executive Board

### Group Functions (Gx)

<table>
<thead>
<tr>
<th>SBU Marine Systems</th>
<th>SBU Power Plants</th>
<th>SBU Turbomachiney</th>
<th>SBU Engines</th>
<th>SBU After Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support Functions EL</td>
<td>Support Functions Rx</td>
<td>Support Functions Ex</td>
<td>Support Functions Ax</td>
<td></td>
</tr>
</tbody>
</table>

- **BU Low Speed (L)**
- **BU Medium Speed (M)**
- **BU Power Plants (P)**
- **BU Process Industry (I)**
- **BU Oil & Gas (O)**
- **BU Production (W)**
- **BU Turbocharger (T)**
- **BU PrimeServ Diesel (D)**
- **BU PrimeServ Turbo (S)**

### Global Organization (GO)
Large Low Speed Two-stroke Engine
12K90MC on Testbed
Weight of engine up to 2500 ton

Engines must be built, where ships are being built
COSCO Guangzhou:
First Diesel with more than 100,000 BHP
Chemical Tanker with Two-stroke Engine 7S50ME-C
50% of World Trade is powered by MAN Diesel & Turbo Diesel Engines!
1912 Selandia: First Ocean-going Vessel
1913 Fionia: Sister ship with licence-built engines
Ship deliveries
DWT, Ships >2000 DWT/GT

Source: IHS Fairplay
Low Speed Licensee Network

Engines are built, where ships are being built

Poland
Cegielski 1959

Russia
Bryansk 1959

Croatia
Uljanik 1954
Split 1967

China
HHM 1980
DMD 1980
YMD 1989
CMD 2007
STX 2007
JAD 2007
ZJCME 2008
ZHD 2008
RPM 2008
YungPu 2008
GMD 2011

Korea
Hyundai 1976
Doosan 1983
STX 1984

Japan
Mitsui 1926
- Makita 1981
- Diesel United 2008
Hitachi incl.
IMEX 1951
Kawasaki incl.
Hanshin 1911

Vietnam
Vinashin 2004

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Two-stroke Low Speed Engines for Marine Applications*

* Small bore engines. Based on Marine Engine IMO Tier II Programme
Two-stroke Low Speed Engines for Marine Applications*

* Large bore engines. Based on Marine Engine IMO Tier II Programme
Genset
8L27/38, 2 640 kW at 750 rpm
Four-Stroke Licensee Network

Engines are built, where ships are being built.

- **U.S.A**
  - Fairbanks
  - Morse Engine
  - 1995

- **Poland**
  - Cegielski/FSA
  - 1959

- **China**
  - SQE
  - 1980
  - SXD
  - 2004
  - HND
  - 2007
  - ZJCM
  - 1980
  - STX
  - 2007
  - JAD
  - 2008
  - ZGPT
  - 2006
  - WHM
  - 2008
  - CSR
  - 2008
  - RPM
  - 2008
  - CNPC
  - 2009

- **Croatia**
  - Brodosplit
  - 1967
  - Uljanik
  - 1984
  - Adriadiesel
  - 1998

- **Spain**
  - Navantia
  - 1965

- **India**
  - Kirloskar
  - 1977

- **Japan**
  - Mitsubishi
  - 1929
  - Niigata
  - 1981
  - Diesel United
  - 1963
  - J.F.E. Engineering
  - 1951
  - Kawasaki
  - 1973

- **Korea**
  - Doosan
  - 1983
  - STX
  - 1977
Four-stroke Medium Speed Engines for Marine Applications*

* Based on Marine Engine IMO Tier II 2nd edition Programme 2010

110% load for navy application and for vessels with approval according HSVR from DNV available

1 h out of 6 h of engine operating time on special request.

<table>
<thead>
<tr>
<th>Engine Model</th>
<th>Performance Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>L58/64</td>
<td>7.860 – 12.600 kW</td>
</tr>
<tr>
<td>L+V51/60DF</td>
<td>5.850 – 9.900 kW</td>
</tr>
<tr>
<td>L+V48/60CR</td>
<td>7.200 – 10.800 kW</td>
</tr>
<tr>
<td>L+V32/44CR</td>
<td>3.360 – 5.600 kW</td>
</tr>
<tr>
<td>L+V32/40</td>
<td>3.000 – 4.500 kW</td>
</tr>
<tr>
<td>V28/33D</td>
<td>4.200 – 9.100 kW*</td>
</tr>
<tr>
<td>V28/33D STC</td>
<td>5.460 – 9.100 kW*</td>
</tr>
<tr>
<td>L27/38</td>
<td>1.500 – 3.285 kW</td>
</tr>
<tr>
<td>L23/30H</td>
<td>1.050 – 1.980 kW</td>
</tr>
<tr>
<td>L21/31</td>
<td>1.000 – 1.980 kW</td>
</tr>
<tr>
<td>L23/30H</td>
<td>650 – 1.280 kW</td>
</tr>
<tr>
<td>L16/24</td>
<td>450 – 990 kW</td>
</tr>
</tbody>
</table>
Global Value Chain

- MAN Diesel & Turbo Engine Designer
- Engine Builder
- Shipyard
- Ship owner
Get access to an international brand accepted by international ship owners

Share development cost with other engine builders

Localization of component production

Production support

Quality support

Support during delivery

Support for engine sales
Shipyard gets relatively cheap engines

Shipyard gets local support during building and delivery of ships, if mishaps occur

Local delivery gives better cash flow
In all major ship building nations a ship owner can purchase a ship with locally built engines of a global design.

Spare parts are uniform and available from at least two sources: The engine builder and the designer.

Readily support all over the world.

Engine builders come and some disappear; however, service is available as the designers prevail.
Conclusion

The Global Value Chain within engine design is of benefit to all parties.

There is no indication that this situation will change in the foreseeable future.
Engineering the Future
– since 1758.
Disclaimer

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