



## The products of the MAN Diesel Group

# Diesel power for turbochargers, GenSets, ships and power plants

**July 2009** – The MAN Diesel Group's product portfolio includes not only diesel and gas-powered large-bore engines for marine propulsion systems and power plants, but also marine auxiliary engines, propulsion packages and turbochargers. The company delivers standardised solutions as well as tailor-made concepts for the use of diesel engines. At MAN Diesel, the development and production of diesel engines has a long tradition. 112 years ago, Rudolf Diesel, together with MAN (back then the Maschinenfabrik Augsburg), developed the world's first diesel engine at the company's headquarters in Augsburg. With its extensive product portfolio, technical expertise and tremendous experience in engine construction, the MAN Diesel Group is the leading supplier of large-bore diesel engines for marine propulsion systems and power plants with unit outputs of up to 97 MW (132,000 HP) per engine. With its two and four-stroke engines MAN Diesel and its licensees are the world market leaders for the propulsion of major seafaring vessels, with a market share of around 50 per cent. In terms of installed propulsion power in the current global trade fleet, around 60 per cent of engines come from MAN Diesel. The company is also one of the leading suppliers of diesel power plants.

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The MAN Diesel Group's product portfolio includes:

### **Marine engines**

In terms of marine propulsion systems, the group offers both two-stroke and four-stroke engines.

The **two-stroke engines**, which operate at lower revs of 76 to 250 rpm, can deliver an output of up to 97,000 kW directly to the propeller. These engines, some of which can be more than ten metres high, are primarily used in large, ocean-going transporter vessels. It is no great surprise, then, that the first major diesel engine to deliver more than 100,000 HP built into a ship was supplied by MAN Diesel.

**Four-stroke diesel engines** from MAN Diesel, which run at medium speeds, are used to propel all types of merchant vessels, but are also used in passenger ships thanks to their compact nature and their amenability to flexible mounting. The necessary total output is delivered via a multi-engine configuration that facilitates optimum engine operation. As well as cruiseliners, other areas of use for medium-speed engines include specialist vessels such as tugs, dredgers or cable-laying ships. Smaller four-stroke engines are used in high-speed ferries and marine vessels.

### **Stationary engines**

In the stationary sector, MAN Diesel engines are primarily used for power plants and emergency power supplies. In this sector, MAN Diesel delivers turnkey system solutions for land-based or floating power plants with outputs of up to 400 MW. Diesel engines are especially ideal for generating energy due to the fact that they achieve the highest level of thermal efficiency, thereby attaining the most cost-effective conversion of primary energy into electrical energy. The range of stationary systems comprises four-stroke engines

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with a unit output of 450 kW to 18,900 kW and two-stroke engines for unit outputs of up to 80,000 kW. MAN Diesel engines are operated using heavy fuel oil, diesel, gas or renewable fuels such as Jatropha oil, animal fat or recycled vegetable oils. MAN Diesel offers a complete solution right down to the substation, including the processing of renewable fuels, from a single source.

### GenSets

MAN Diesel offers an extensive range of auxiliary engines, known as GenSets, for the reliable and cost-effective generation of energy on board ships. Four-stroke engines delivering between 450 kW and 11,200 kW are used for these applications. To ensure maximum cost-efficiency, GenSets are today operated using the same quality and viscosity of fuel as the main engines. In order to keep the installation outlay for the on-board fuel systems as minimal as possible, MAN Diesel offers complete fuel systems. These units are available in three standardised sizes for GenSet outputs of up to 4,400 kW.

### Turbochargers

MAN Diesel builds modern, high-efficiency exhaust gas turbochargers for high charging pressures with single-stage radial and axial turbines. The performance spectrum of these chargers, which are used both in two-stroke and four-stroke marine engines and on stationary systems, ranges from around 400 kW to 30,000 kW of engine power per turbocharger. The degrees of efficiency achieved, which are higher than required for the charging of a diesel engine, mean that excess generated power can be removed from the charging system and used to boost the efficiency of the

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overall system. This led to the development of power turbines for turbo-compound systems. MAN Diesel supplies these power turbines in four sizes with outputs ranging from 850 kW to 4,700 kW. To reduce fuel consumption and harmful emissions, MAN Diesel also offers optional variable turbine geometry (VTA).

### **Supplementary**

The broad spectrum of development work carried out at MAN Diesel has advanced not only diesel-powered propulsion systems but also other technologies that are now also part of the company's portfolio. The major foundry in Augsburg, in which crankcases and many other parts of diesel engines are made, also offers its services to external customers. The ability to mould cast parts weighing up to 110 tons is utilised in part by companies from the wind turbine sector.

As well as complete marine propulsion packages, which generally include the main engine, the shaft, the gear and a CP propeller, MAN Diesel also offers electronic control systems which are marketed under the name SaCoS<sub>one</sub>.

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