

Power Plants

Energy wherever you need it



Engineering the Future – since 1758.

MAN Diesel & Turbo





Engineering the Future – since 1758.

MAN Diesel & Turbo is one of the world's leading suppliers of land-based and floating power plants based on large diesel and gas engines. Over the last century we have built thousands of diesel power plants worldwide. The experience we have gained and the technology we have developed over that time enables our specialists to tailor power plants to the individual needs of customers all over the world.

During this long history the companies within the MAN Group have always been world leaders in their fields, both in design engineering and the commercial application of new technologies and, more recently, the innovative integration of mechanical engineering with state-of-the-art electronics.

Our technological leadership and clear-cut customer orientation serve to maintain and strengthen our position in all our markets. 90% of the products of the MAN Group, such as diesel engines, turbochargers, commercial vehicles and turbo-machinery enjoy top three sales rankings in their markets.

MAN Diesel & Turbo Power Plants

Generating success



The Economic Solution

Power generation employing large reciprocating engines is an increasingly popular solution in a world of rapidly expanding demand for electrical power.

With our advanced technology and wide, global experience of power plant planning and construction MAN Diesel & Turbo is a reliable partner for all categories of electricity producer and all scopes-of-supply:

- From single engines and generator sets to complete, made-to-measure turnkey power plants acting as main contractor / consortium leader
- From major national utilities to operators of municipal or industrial co-generation plants and Independent Power Producers (IPPs) operating Power Purchase Agreements (PPAs)

Power plants from MAN Diesel & Turbo offer:

- Highest fuel efficiency
- Low maintenance, high reliability
- Excellent power quality and security
- Operational flexibility, from baseload to standby
- Rapid construction from earthworks to first kWh
- Wide fuel flexibility
- Wide scope for thermal energy recovery
- Insensitivity to "hot and high" locations
- Modular concept for flexible capacity expansion

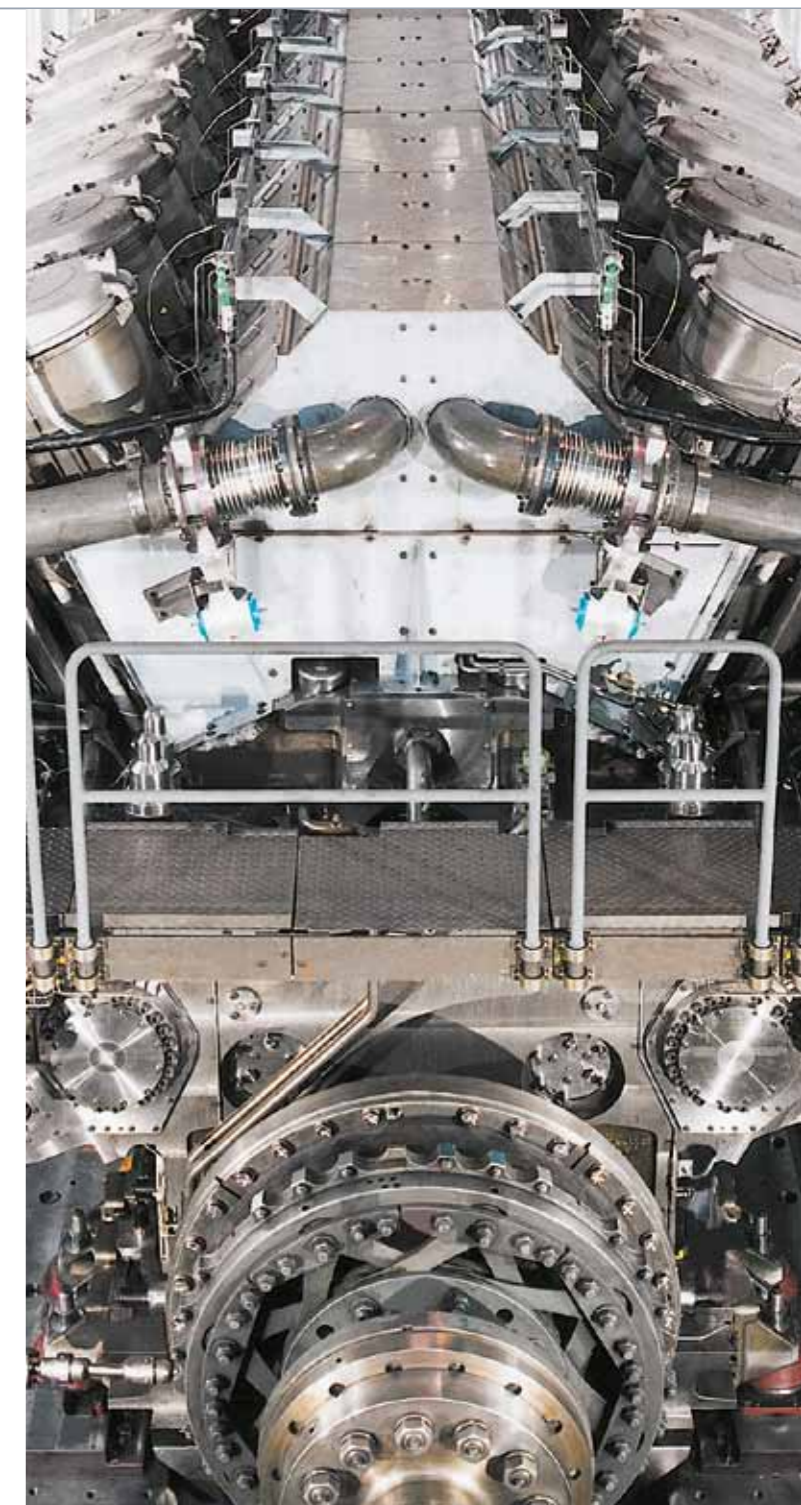
Quality and reliability = availability

Precise manufacturing and thorough testing guarantee the reliability and operational safety of the diesel and gas engines at the heart of MAN Diesel & Turbo power plants. Robustness, reliability, ease of operation and maintenance are the preconditions for availabilities above 8000 hours per year.

MAN has the answer to your requirements

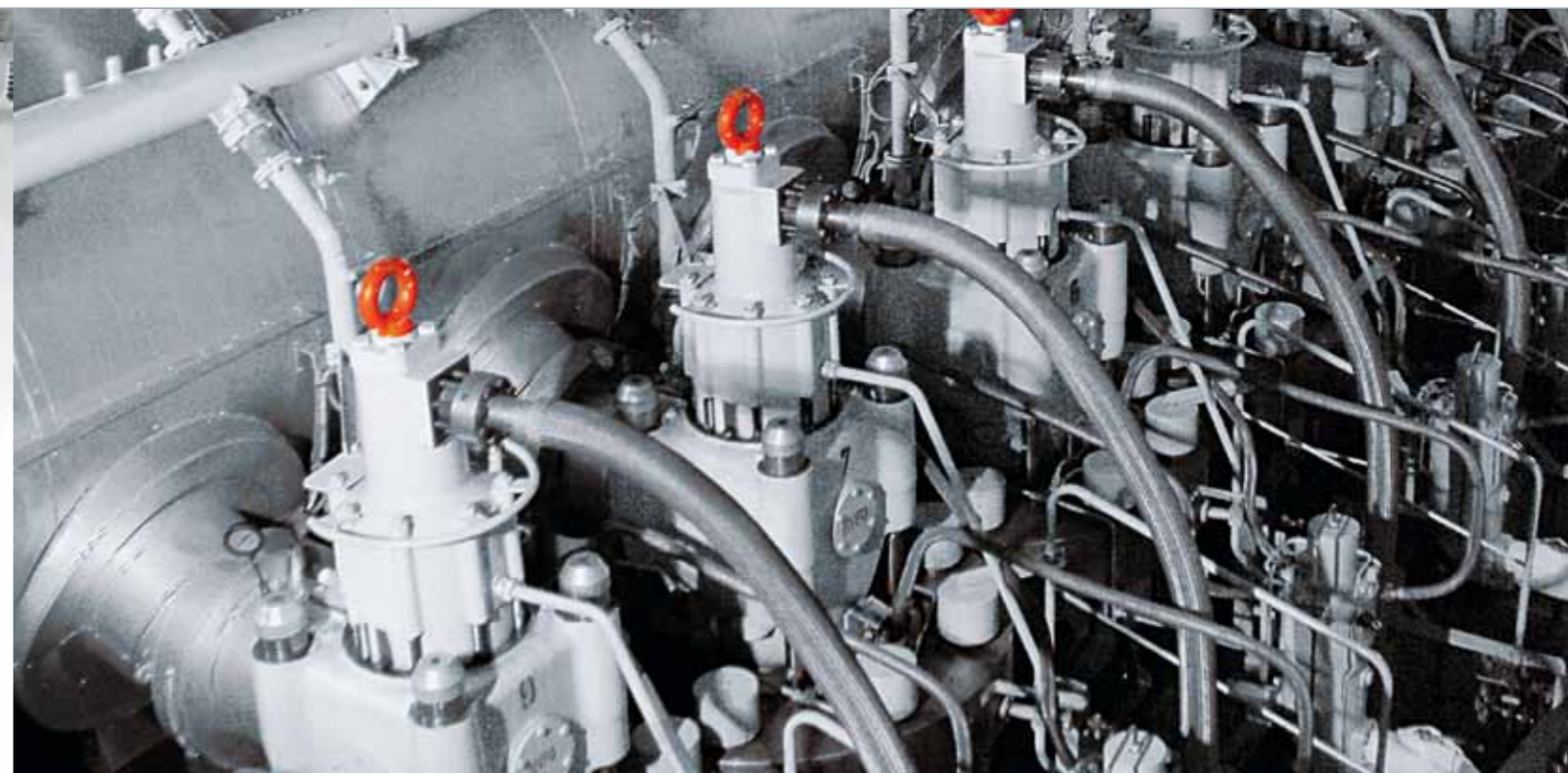
General Information

Type	Power range (kW)	Speed range (r/min)
2-stroke		
K98MC-S	40,680 - 79,520	102.9 - 103.4
K90MC-S	23,870 - 51,840	107.1 - 109.1
K80MC-S	18,830 - 40,680	107.1 - 109.1
K60MC-S	12,460 - 27,720	150
K50MC-S	7,980 - 20,300	176.5 - 180.0
L35MC-S	3,570 - 7,740	211.8 - 214.3
4-stroke		
V51/60G	11,700 - 18,000	500 - 514
L51/60G	8,775 - 9,000	500 - 514
V51/60DF	11,700 - 18,000	500 - 514
L51/60DF	8,775 - 9,000	500 - 514
V48/60CR	12,600 - 21,600	500 - 514
L48/60CR	9,450 - 10,800	500 - 514
V48/60	12,600 - 21,600	500 - 514
L48/60	9,450 - 10,800	500 - 514
V32/44CR	6,720 - 11,200	720 - 750
L32/44CR	3,360 - 5,600	720 - 750
V32/40	6,000 - 9,000	720 - 750
L32/40	4,500	720 - 750
V32/40PGI	5,160 - 8,100	720 - 750
V32/40DF	4,620 - 7,200	720 - 750
L32/40DF	2,310 - 3,600	720 - 750
V28/33D	4,860 - 9,100	900 - 1,000
V28/32S	3,600 - 4,230	720 - 750
L27/38	1,500 - 2,970	720 - 750
L21/31	1,100 - 1,980	900 - 1,000
L16/24	450 - 990	1,000 - 1,200



Efficiency

Best-in-class



The direct route to economy and ecology

Since its invention over 100 years ago at the Maschinenfabrik Augsburg - today's MAN – the diesel engine has never lost its status as the most efficient system for converting fuel into mechanical energy.

Currently extending to over 52%, the efficiency of the largest power units from MAN Diesel & Turbo is unrivalled in the combustion engine field.

This translates into maximum power, minimum fuel consumption and lowest carbon dioxide emissions.

New Perspectives

Unique among large engine builders MAN Diesel & Turbo has all the major elements of engine technology inhouse. This ownership continues to pay off in the form of market leading performance in all areas.

Latest Technologies

Under the control of the SaCoS electronic safety and control system, MAN Diesel & Turbo's own common rail fuel injection system, VTA variable turbine area turbocharging, VVT variable valve timing and high pressure turbocharging technologies allow flexible setting of all major parameters.

In baseload applications, the MAN Diesel & Turbo two-stage high-pressure turbocharging technology package enables simultaneous improvements in fuel efficiency, NO_x emissions and specific power output.

For variable load applications, the Variable Miller Cycle technology package enables these benefits to be extended across the complete engine operating profile.

Type of power plant	MW	Investment	Operating costs	Flexibility	Construction period
Coal power plant	> 300 MW	High	Low	Low	Long
Diesel engine	< 250 MW	Low	Low	High	Short
Gas engine	< 250 MW	Low	Low	High	Short
Gas turbine	> 100 MW	Low	High	Low	Short

Energy recovery

Extracting the maximum



MAN Diesel & Turbo operates its own industrial co-gen plant at its Augsburg works, where diesel and gas engines provide electrical power for the foundry furnaces, process heat and district heating.

Heat and Power

Building on their best-in-class mechanical efficiency, where there is a use for the thermal output of an engine from MAN Diesel & Turbo – i.e. heat recovered from its lubricant, intercoolers, coolant and exhaust gases - overall energy utilisation levels well over 90% can be achieved.

Co-generation, tri-generation

In co-generation or “combined heat and power” (CHP) plants, this energy can be used to heat water or generate steam. These heat sources can be used for industrial processes or for heating and cooling of dwellings, office blocks, factories, and shopping malls – i.e. district heating - or spas and swimming pools.

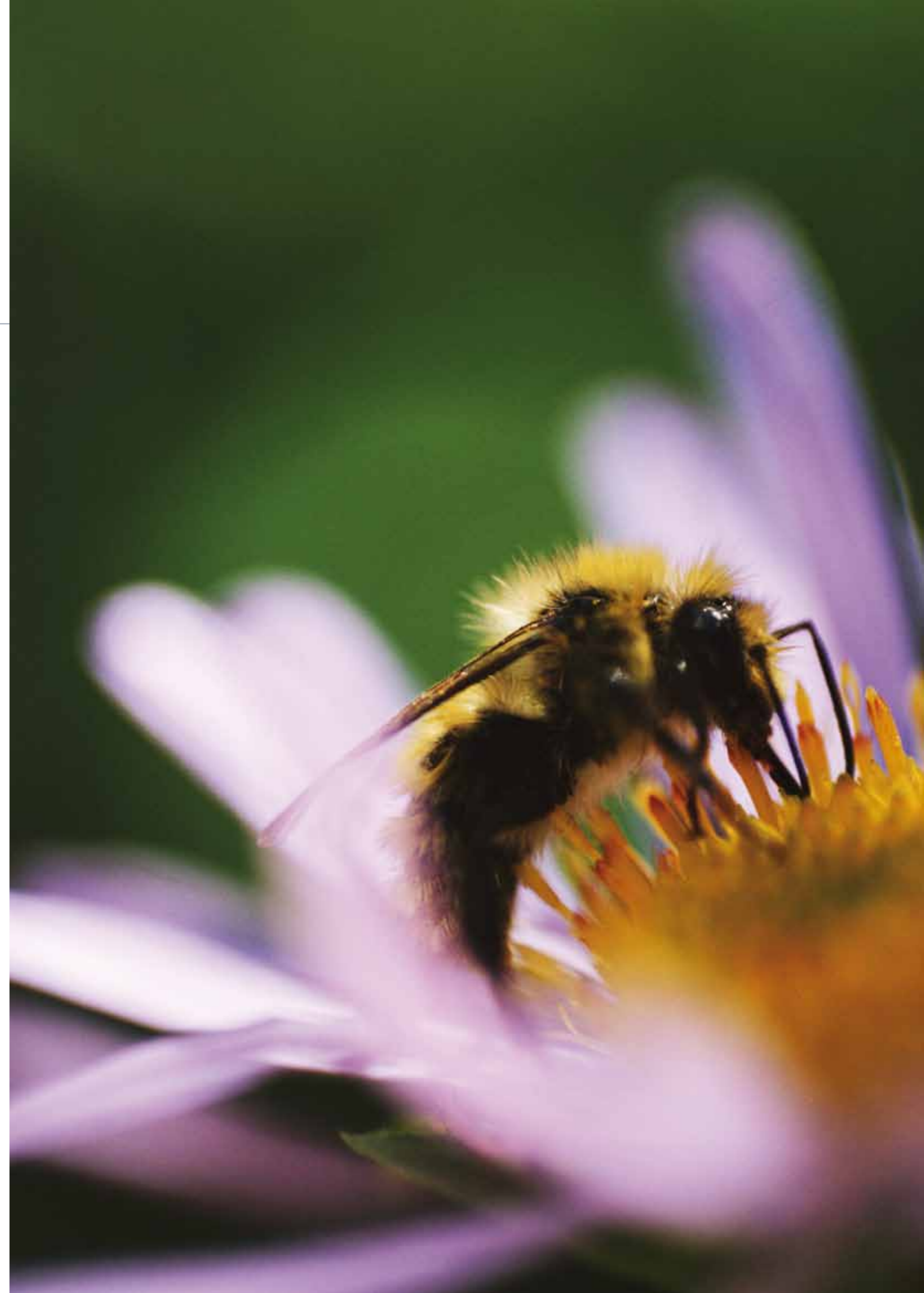
Diesel combined cycle

Alternatively, the hot exhaust gases can be directed to a boiler to generate steam to drive a turbine generator. Typically, this “diesel combined cycle” arrangement can augment the electrical output of engine powered generators by as much as 10 to 15% without consuming additional fuel.

Power turbine

Other energy optimisation strategies include inserting a power turbine into the exhaust gas flow.

The energy thus recovered can be returned to the engine crankshaft via gears or used to drive a small generator or hydraulic pump to produce electrical power or drive hydrostatic equipment.



Operational Flexibility

Power plants “à la carte”



Any application

The efficiency, availability, reliability, ease of operation, maintenance-friendliness and fuel flexibility of diesel and gas engines from MAN Diesel & Turbo enable a maximum range of applications:

- Baseload generation based on availabilities over 8000 hours p.a.
- Standby generation based on rapid start-up and black-start capability
- Power security based on multi-fuel supply
- Power quality based on advanced electronic engine governing
- Load following based on flexible output control
- Co-generation and tri-generation based on market leading efficiency
- Grid connected, grid parallel or stand-alone

Any location

You will also find MAN Diesel & Turbo power plants in every part of the world - both as permanent structures or in the form of our highly mobile, highly versatile Power Barges for use at locations with waterborne access - on rivers, lakes, coasts and in harbours.

With their insensitivity to ambient conditions, diesel and gas engine power plants operate in the least hospitable regions on earth – in deserts, in arctic regions, at low altitude or high in the mountains. Whether in hot and dry climates, tropical humidity, perma-frost or where temperatures vary widely, power plants from MAN Diesel & Turbo provide dependable energy.



Generator sets from MAN Diesel & Turbo provide electrical power and heat in cold climates. We are the major supplier of power plants to Greenland.

Fuel Flexibility

The choice is yours



Liquid fuels

Designed for heavy fuel oils (HFO), diesel engines from MAN Diesel & Turbo can operate on the widest range of liquid fuels and - importantly - viscosities. These include crude oil, heavy (residual) fuels and distillate diesel oils on the fossil fuel side; vegetable oils and animal fats on the renewables side; second generation bio-fuels such as BTL (biomass-to-liquid). In emissions sensitive applications, MAN Diesel & Turbo also has wide experience with fuel-water emulsions.

Gaseous fuels

Likewise, gas engines from MAN Diesel & Turbo can operate on a full range of natural and non-natural gases. In a future-oriented project, MAN Diesel & Turbo has also verified the feasibility of running an engine on hydrogen using a diesel (spontaneous ignition) combustion system.

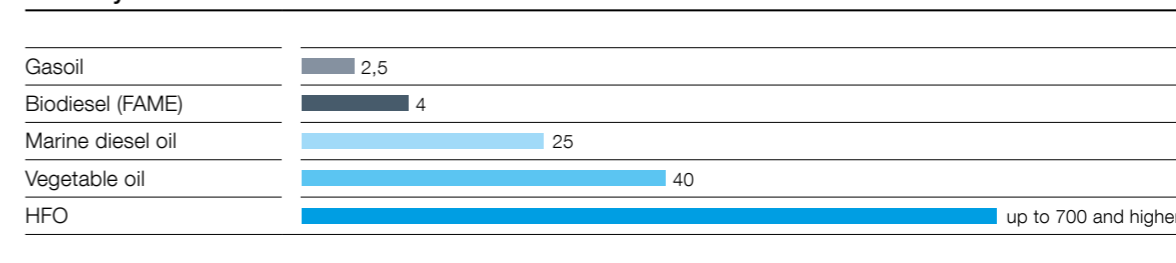
In this way MAN Diesel & Turbo can offer gas engines with dual fuel or Otto combustion technology capable of powering a comprehensive application spectrum.

Renewable in, renewable out

An established speciality at MAN Diesel & Turbo is "Renewable in - Renewable out" - i.e. burning CO₂ neutral fuels in advanced co-generation and tri-generation plants where the thermal output of the engine is used to produce a further renewable fuel.

In a prominent example, recovered engine heat is used both to accelerate the fermentation of sewage to produce gas for a gas engine and to dry the resulting sludge for combustion in furnaces.

Viscosity@40 °C in cst



Emissions

Technology for ecology



Better than all emissions regulations

The emissions values of MAN Diesel & Turbo power plants can undercut the limits set by the World Bank – a valuable, long-term contribution towards conserving the environment.

The future included

The technologies needed to meet the ever more stringent emission regulations of the future are already available or under development at MAN Diesel & Turbo.

Those technologies under development centre on both primary measures - i.e. improvements based on the basic technological elements of all engines - and secondary measures i.e. those involving the conditioning of the fuel and combustion air or the after-treatment of the exhaust gases.

Our Aims

Our commitment is clear: to lower emissions of both noxious substances and greenhouse gases while also improving fuel consumption and other operating cost factors such as maintenance and servicing costs.

At the same time, we have wide experience with all state-of-the-art secondary emissions reduction measures including conditioning of the fuel and combustion air and exhaust gas aftertreatment.

The latter comprises reduction of oxides of nitrogen (NO_x) via selective catalytic reduction (SCR), oxidation catalysts in combination with lean burn gas engine technology and removal of oxides of sulphur (SO_x) by exhaust gas scrubbing.

Project Finance

Making it happen



A solid basis

Long term investments require long term financing. As a member of the MAN Group with its 15 billion EUR sales volume, active in more than 50 countries worldwide we have longstanding relationships to financial institutions on every continent. With production facilities in Germany, France and Denmark and as a major exporter from those countries, we have an excellent track record of cooperation with national export credit guarantee agencies (Euler Hermes, COFACE, EKF) as well as with private credit insurers.

Risk management

MAN Diesel & Turbo can help you limit many of the risks in financing and construction, operation and maintenance, as you consider necessary. In other words, you concentrate entirely on your core business and we take care of the energy.

Networking

Our tight network allows us to structure tailor-made, long term financing. ECA-covered loans can be offered at attractive interest rates for terms of up to 12 years starting from commercial operation of a power plant.

Varied options

You, the customer can then choose between variable interest charges based on interbank rates e.g. LIBOR or fixed rates for the entire loan period.

Combinations of international or regional development banks, ECA covered portions and local institutions have the potential to secure financing even under difficult capital market conditions.



World Class Service

Our eyes on your plant



MAN PrimeServ - peace of mind for life

With more than 150 PrimeServ service stations and service partners worldwide and our growing network of PrimeServ Academies, the MAN Diesel & Turbo after-sales organisation is committed to maintaining the most efficient, accessible after-sales organisation in the business.

PrimeServ's aim is to provide:

- Prompt, OEM-standard service for the complete life cycle of an installation
- Tuition and qualification of service personnel at our PrimeServ Academies to maximize the availability and viability of a plant
- Rapid, global availability of genuine, 100% quality assured MAN Diesel & Turbo spare parts via local outlets or our 24 hour hotline

PowerManagement by MAN Diesel & Turbo

Complementing the PrimeServ after-sales offering is the MAN PowerManagement concept.

MAN PowerManagement packages provide integrated support solutions for all aspects of the running of a power or co-generation plant. Individually negotiated agreements can cover assistance with - or delegation of - the management of all mechanical, electrical and thermal equipment. In this way the power plant operator gains comprehensive access to the technology, experience, best practices and professional resources of MAN Diesel & Turbo.

In short: PowerManagement by MAN Diesel & Turbo allows you to benefit from our specialist expertise in running a power plant while you concentrate on your own core business.

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