

Gas Power Plants



Engineering the Future – since 1758.

MAN Diesel & Turbo





MAN Diesel & Turbo

Leading technology, lasting benefits

MAN Diesel & Turbo, as the name suggests, is best known for its robust diesel technology. But we also have increasing expertise in clean-burning gas and dual-fuel engines. Developing efficient, viable green technology is a key focus for our business.

Our dedication to quality is legendary. Our gas engines are entirely designed and built at our own facilities, giving us unbeatable hands-on control and visibility. So our engines are built to last, with more uptime and less maintenance.

Whether stand-alone engines, gensets or turnkey power plants, we create one-stop solutions that precisely meet your needs. We offer a true partnership: expert advice and lifelong support. And whenever and wherever needed, our global network of service hubs delivers expert, rapid on-the-spot assistance.

Why Go for Gas?

Gas to Energy

Clean, efficient and flexible



Gas is an increasingly popular option for power generation. One reason is the growing availability of gas via grids and LNG; another is its value for money. A key advantage of gas power plants is their flexibility: they can be activated rapidly, making them an excellent source of peaking baseload power.

Even better, gas engines can produce combined heat and power (CHP). By harnessing the thermal energy that is a by-product of generating electrical energy, these systems achieve exceptional levels of efficiency. In other words, CHP, or cogeneration as it is also known, saves even more money, saves even more energy and is even better for the environment.

Above all, gas has a lower environmental impact. That makes gas an attractive choice to meet strict emissions limits or take advantage of green power incentives. And because it burns cleanly, a gas power plant can be built close to urban areas.

Gas is clean

Low emissions and high efficiency in energy production play a key role in investment decisions. As emission requirements and regulations become more and more stringent, gas offers many advantages:

- Low CO₂ emissions
- Low NO_x emissions
- No SO_x emissions
- No particle emissions

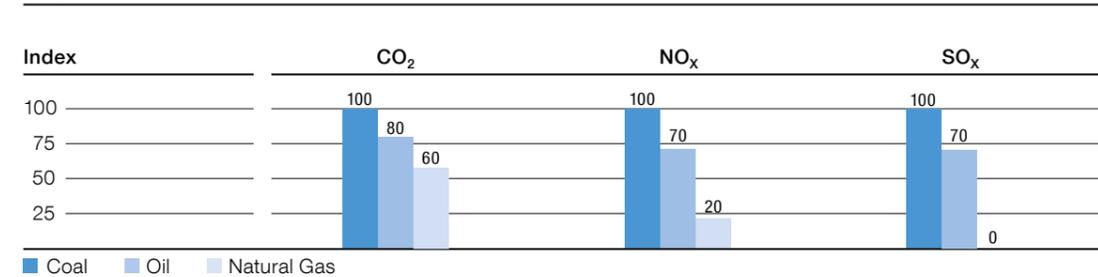
Gas is efficient

Producing electricity from gas is highly efficient. Gas power plant operation and maintenance costs are lower than those of plants burning other fossil fuels.

Gas is flexible

No matter what your requirements are – power generation, CHP or tri-generation – MAN Diesel & Turbo gas engines reliably supply cost-effective energy.

CO₂, NO_x and SO_x emissions of different fuels



Why Choose MAN Diesel & Turbo?

Gas engines

At MAN Diesel & Turbo, we recognise that a gas power plant is a significant long-term investment – and robust returns require robust engines.

Enduring quality

Our longstanding reputation for efficient, reliable and durable engines is something we are proud of – so we strive to uphold it. To ensure our products continue to meet our stringent standards, our engines are still produced by our skilled employees at our own facilities. We therefore have total visibility into each and every step of the manufacturing process – and we understand each and every step. The result is exceptional products that offer the dependability and efficiency essential for a robust return on any gas power investment.

Genuine partnership

We bring the same approach to our service. A significant investment deserves a genuine partnership – not just a quick sale of a standard, off-the-peg product that might not fully be appropriate for your situation. We take the time to listen to your specific needs, and will give you honest expert technical advice about what might work best for you – no false promises. The result is a tailor-made solution that perfectly suits your requirements.

Genuine service

We provide quality service to match our quality products. What MAN Diesel & Turbo offers is a genuine service. We listen to our customers' specific needs, and give expert advice in response. As a result, we create solutions tailored perfectly to meet your individual requirements. And that is just the beginning – because a genuine service means lifelong support. With more than 150 service hubs around the globe, we can quickly mobilise the expert advice and / or replacement parts you need, so that you can get back into operation without delay. Our solutions cover stand-alone engines, gensets or turnkey power plants; we can even operate them on your behalf if needed.



Engines that Deliver

Efficiency, reliability and durability

The 51/60DF Engine

Dual-fuel flexibility



Our engines can achieve extremely high efficiencies (up to 90 per cent when used in combined heat and power plants). And our engines are also famously reliable. They require very little maintenance, which means less unproductive downtime.

Dual fuel flexibility

MAN Diesel & Turbo's dual-fuel engines will run on gas, diesel, biofuel or heavy fuel oil (HFO), giving greater fuel flexibility. If one kind of fuel becomes difficult to obtain, or prices move beyond reach, our engines can be simply switched to another source of fuel.

Retrofits

If you already have a MAN Diesel & Turbo engine but want to take advantage of gas, we may even be able to convert your existing engine. Contact us to find out how we can adapt your existing 48/60 diesel engine to the 51/60 DF model.

The dual-fuel 51/60DF engine from MAN Diesel & Turbo can convert either liquid fuel (diesel operation) or natural gas into electricity – switching seamlessly from gas to diesel as required. Efficient and environmentally friendly, the versatile V51/60DF can be operated on a variety of fuels.

Diverse fuel options

The 51/60DF engine is designed for operation with liquid and gaseous fuels. In liquid fuel operation, the engine can run on HFO with a viscosity of up to 700 mm²/s (cSt) at 50°C (specified in CIMAC 2003 H/K700/DIN ISO 8217). Between 20 per cent and 100 per cent load, the engine can operate continuously with HFO.

Advanced gas technology

In gas operation, the engine injects a minimal quantity of pilot fuel into the prechamber. This amounts to just one per cent of diesel oil consumption in gas mode. As a result, the engine emits fewer pollutants and needs only small storage tanks for secondary fuel. Electromagnetic valves accurately meter gas for each cylinder individually, making the 51/60DF highly efficient.

Very low firing pressure fluctuations between the cylinders mean the engine runs smoothly. And a lean-burn gas/air mixture results in very low NO_x values.

Reliable output

The 51/60DF can be changed over from gas to diesel fuel operation at full load without output and speed fluctuations. This allows the engine to be used in a wide array of settings, from providing redundancy to delivering security in a precarious supply situation. For example, the 51/60DF can be deployed in a back-up genset, in case of power supply interruptions. Or in a gas power plant, the engine can be operated in a diesel genset in case of gas supply interruptions.

Applications

Right for any environment



Regardless of your energy needs – heating, cooling or electricity – MAN Diesel & Turbo gas engines combine the highest efficiencies with the lowest emissions. So no matter what the application, our engines can deliver advantages for your business – and the environment.

Urban

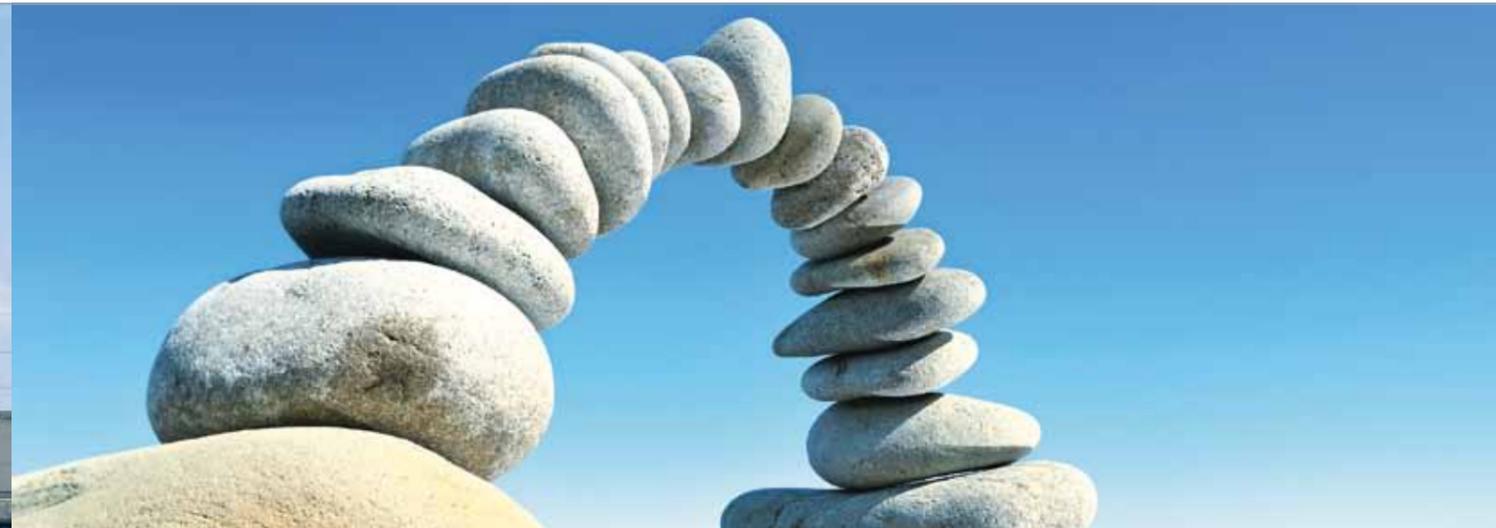
In densely populated urban areas, the requirements concerning space, emissions and noise protection for a power plant are restrictive. To deliver much-needed power to cities and towns, more CHP plants are being built every year. CHP plants with MAN Diesel & Turbo engines are able to reach an overall efficiency of more than 90 per cent. In addition, their clean-burning gas technology allows them to be built close to residential areas.

Industrial

Industrial areas normally have fewer restrictions relating to space and noise protection. But gas engines still offer considerable benefits, especially in a CHP plant. Depending on the application, heat from the production process of electricity can be used in many different ways, for example heating rooms or water, or in drying processes.

Turnkey Power Plants

Built to your specifications



MAN Diesel & Turbo doesn't just build engines. Our expertise covers the whole process of planning, constructing and operating a gas power plant. MAN can provide turnkey solutions for plants in excess of 50 megawatts.

From start to finish

Our expertise covers the whole process of planning, constructing and operating a gas power plant. We have the technology, but we also know the suppliers, the local legal and regulatory framework, and the subsidies and incentives available. We can advise on the economic feasibility as well as the technical challenges presented by a potential new project.

Constructed by experts

A special project team, comprising a mix of global and local experts, is formed to develop an integrated, tailor-made solution for each project. As a result, each project receives the benefits of both in-depth experience of power plant design and construction and relevant local understanding.

Smooth operation

Once we have built the plant, we can even operate it, so our customers can focus on their core business. We take care of everything, including staffing the plant, day-to-day operation and maintenance, troubleshooting, performance reporting and general logistics.

Lifelong support

With the benefit of MAN Diesel & Turbo's quality service, our customers can also run the plant themselves, without difficulty.

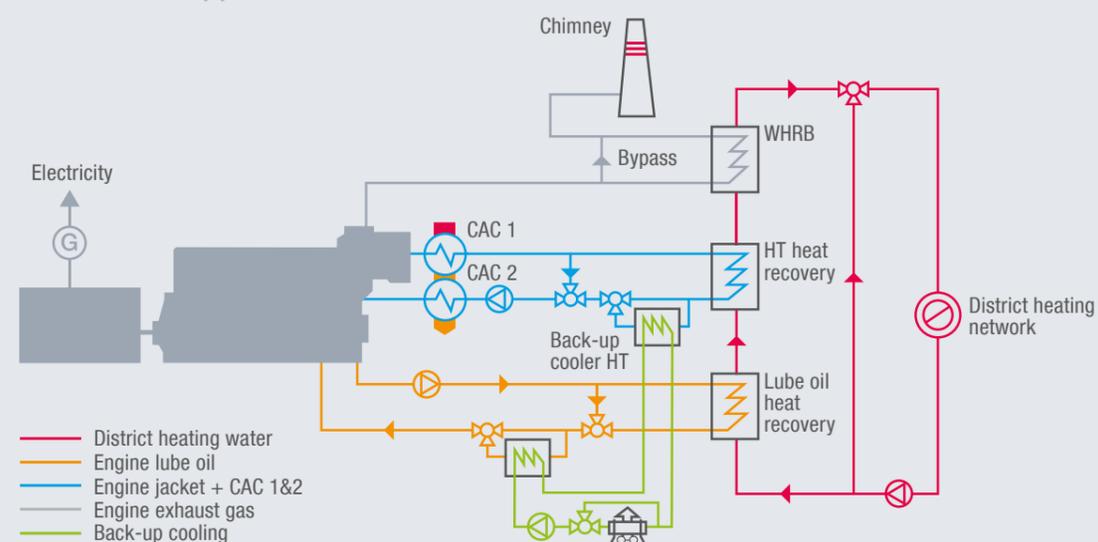
Expertise in combined heat and power

Our solid track record in project execution includes CHP plants. Our expertise means we don't need to call on any external specialists for assistance or form costly joint ventures. That minimises costs and potential complications.

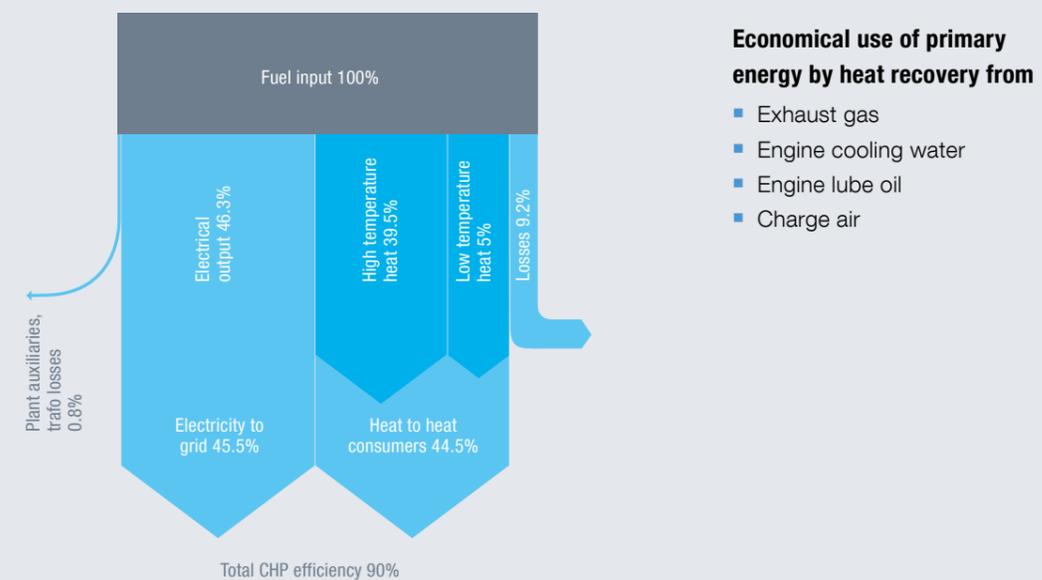
Heat Recovery Ensures High Efficiency

Combined heat and power

Possible engine heat recovery – hot water generation for different applications



Energy flow diagram for hot water applications*



When electricity is generated in engine-based power plants, waste heat at different temperature levels is produced. MAN Diesel & Turbo offers different technologies to convert this waste heat into a useful energy form.

MAN Diesel & Turbo's engine based CHP plants are designed to meet the overall thermal demand of the end consumer and can be used for a wide range of thermal applications – whether at industrial, city-wide or at individual building levels.

The heat extracted from engine's exhaust gases can be utilized for steam generation required in the textiles, food, paper and chemicals industries. By including an exhaust gas or hot water driven absorption chiller, chilled water – to run central air conditioning systems in hospitals, hotels and office blocks – can be produced. The heat extracted from the engine lube oil, the engine jacket water and the charge air cooling circuits can be utilized for hot water generation, e.g. used in a district heating network for heating purposes.

* Based on 20V35/44G ISO-3046 conditions; efficiencies valid at a return line temperature of 60°C and supply line temperature of 125°C

Benefits

- Lower energy costs through more efficient utilization of primary energy
- Improved environmental quality through reduced emissions of pollutants
- Recovered waste heat for a wide range of sustainable thermal applications
- Operational flexibility according to changes for heat and electricity demand

General Information

Engine type	Power range	Speed range (r/min)
	(kW _{mech})	50, 60 Hz
V51/60G	12,600 - 18,900	500, 514
V35/44G	10,200 - 10,600	720, 750
V51/60DF	11,700 - 18,000	500, 514
L51/60DF	8,775 - 9,000	500, 514

World Class Service

Expert advice and assistance



PrimeServ – peace of mind for life

With more than 150 PrimeServ service stations and service partners worldwide and our growing network of PrimeServ Academies, MAN Diesel & Turbo 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
- Training and qualification of service personnel at our PrimeServ Academies to maximise the plant's availability and viability
- Rapid, global availability of genuine, 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 running 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. This gives the power plant operator 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 core business.



All data provided in this document is non-binding. This data serves informational purposes only and is especially not guaranteed in any way. Depending on the subsequent specific individual projects, the relevant data may be subject to changes and will be assessed and determined individually for each project. This will depend on the particular characteristics of each individual project, especially specific site and operational conditions. Copyright © MAN Diesel & Turbo. D2366331EN-N5 Printed in Germany GMC-AUG-07122

MAN Diesel & Turbo

86224 Augsburg, Germany

Phone +49 821 322-3897

Fax +49 821 322-1460

powerplant@mandieselturbo.com

www.mandieselturbo.com