Offshore
E&P

MAN Energy Solutions
Future in the making

Safe and reliable engine solutions
MAN Energy Solutions is the world’s leading provider of large-bore diesel engines, turbomachinery, and integrated power systems. We make four-stroke and two-stroke engines for marine and stationary applications, turbochargers and propellers, gas and steam turbines, compressors and chemical reactors.

Our marine systems expertise is focused on emission reduction, complete propulsion packages, electrical propulsion, dual fuel, LNG, and digitized services.

In the demanding field of offshore exploration and production (E&P), with its many technological, environmental and economic challenges, we offer you innovative solutions that take into account both current and future market demands.
Powerful solutions for complex challenges

Going further in safety
The extraction of subsea oil and gas is becoming ever more complex. The new frontiers are geological, technological and economical. The wells are deeper and further offshore, the seas are heavier, the weather colder. These conditions increase the risk of accidents, spills and fires. Paradoxically, the price of petrol is low, so operations have to be very carefully costed. The challenges are present at every stage, from exploration to well decommissioning. Reliable propulsion systems are crucial to the safe advancement of every project.

The right power fit
Offshore E&P equipment comes in many shapes and sizes, from gigantic production and storage vessels to the smaller drill ships, but they all have one thing in common: they always need a continuous power supply that is safe, reliable and efficient. Providing a good power fit for your needs is our field of expertise.

Engine features for offshore success
Engines for offshore applications require fast start-up times and they must allow big load steps while keeping frequency drops within limits. Environmental regulations call for after-treatment solutions and low SFOC is increasingly important. The use of well-associated gas and crude has become a key economic and environmental advantage. Useful resources should be harnessed, not wasted by flaring.
Four-stroke engines for Offshore E&P

- **MAN 21/31 GenSet**
  - 1,000 – 1,980 kW

- **MAN 27/38 GenSet**
  - 1,500 – 3,150 kW

- **MAN 32/44CR GenSet**
  - 3,600 – 6,000 kW
  - 7,200 – 12,000 kW

- **MAN 35/44DF GenSet**
  - 3,060 – 5,300 kW

- **MAN 51/60DF GenSet**
  - High efficiency
  - 6,200 – 5,400 kW
  - 12,000 – 18,900 kW
  - High power
  - 6,900 – 10,350 kW
  - 13,800 – 20,700 kW

- **MAN PA6B OG GenSet**
  - 4,200 – 7,400 kW
Keep the power flowing

Very sophisticated technology is needed to extract oil and gas in remote, deep waters. Floating production storage offloading vessels (FPSO) and the newer floating liquefied natural gas facilities (FLNG) provide three key functions: treatment of crude oil and gas, storage and offloading. All three jobs require a continuous power source.

Safe, clean and cost-effective

The combination of hydrocarbon processing and marine technology makes health and safety a key consideration for the people who work on FPSOs and FLNGs. We also have to take into account the safety of the natural environment and the adaptability of the vessels to different environmental conditions and emission regulations.

A reliable source of high-output, high-availability power is critical. But so are costs. That’s why it’s a good idea to use surplus crude oil or waste gas from the wells instead of flaring.
Flexibility on a big scale  

**MAN 51/60DF**

This is a highly efficient dual fuel engine that produces low emissions and can be conveniently switched from gas mode to liquid fuel mode and vice versa without interruption. In a multiple dual fuel engine plant, the MAN 51/60DF ensures high reliability and speed flexibility at any time and load.

**Benefits**

- **High power output**
  - Up to 1,150 kW per cylinder

- **Safe engine operation**
  - In accordance with latest standards and regulations

- **Operating stability and flexibility**
  - Gas start capability, seamless switch from HFO to gas mode and vice versa, gas operation even above 100% MCR

- **Full environmental compliance**
  - IMO Tier III in gas mode and liquid mode (with optional MAN SCR)

**Offshore power solution**

The MAN 51/60DF can be used within the MAN offshore power module to convert surplus gas into a cost-effective source of power. This simple, flexible and modular system includes all the necessary equipment (fuel oil pumps and filters, coolers, starting air compressors and receivers, etc.). It can burn diesel, crude oil or gas. And it can be deployed in almost any offshore location.

**Safety beyond the standards**

The operational stability and flexibility of the MAN 51/60DF and its ability to seamlessly switch fuels are factors that contribute to its general safety. Furthermore, the engine comes with MAN SaCoS, a safety and control system that enables safe engine operation in liquid fuel or gas mode.

**Flexible fuel sharing**

The capability to operate the engine in gas, liquid or fuel sharing mode with HFO, MDO, MGO or LNG ensures the highest fuel flexibility. It also offers maximum usage of boil-off gas under the most efficient engine operation.

**Ease of maintenance**

Thanks to a special split in the upper shaft area, there is no need to open the conrod bearing for removal. The design also offers a low piston extension height.

**Further power solutions**

- MAN 21/31 GenSet
- MAN 27/38 GenSet
- MAN 35/44DF GenSet
Maintaining the flow

A floating storage offloading (FSO) unit can stay moored at the site of the oil or gas well for years, using an offloading system to transfer the crude oil or gas to shuttle tankers for shipment to refineries.

The need for non-stop power

FSOs have to comply with the strict health and safety regulations of the offshore oil and gas industry as well as the environmental legislation. The success of an FSO project can be affected by many factors including political stability, the remoteness of the well, environmental conditions and the changing price of gas or oil.

In order to do its job effectively, an FSO needs a continuous power supply that is affordable, highly available and reliable.
The MAN 35/44DF GenSet allows you to harness all the benefits of dual fuel flexibility. In gas mode, it complies fully with IMO Tier III standards. In liquid fuel mode, it fulfills IMO Tier II regulations.

The engine is equipped with a common rail injection system with injection pressures of up to 1,600 bar. With 530 kW/cyl, the engine yields the highest power output in its segment. The solid design is based on the MAN 32/44CR. Its reliable technology reduces daily maintenance and maximizes TBOs while ensuring safe operation in all fuel modes. Its success is demonstrated by the increased vessel resale value.

Benefits
- Full environmental compliance
- IMO Tier III in gas mode and liquid mode (with optional MAN SCR)
- Established technology
  Design based on proven MAN 32/44CR engine
- Fuel flexibility
  HFO, MDO, MGO and natural gas

One source for engines and compressors
Oil & gas applications require elaborate combinations of engine and compressor technologies. Using MAN systems reduces the complexity. We make efficient and cost-effective barrel-type centrifugal compressors as well as screw compressors with best-in-class reliability up to a discharge pressure of 1,000 bar. We can provide you with the compressors and engines under one contract and with one point of contact, simplifying your processes and ensuring better service.

Dual fuel technology
Pioneering hardware and software for engine control, monitoring and diagnostics. Enables full fuel flexibility (HFO, MDO, MGO and natural gas). Seamless switch from HFO to gas mode and vice versa; gas operation even above 100% MCR.

MAN SaCoS (safety and control system on engine)
Combines all functions of modern engine management in one complete system. It controls the additional pilot injection system as well as the gas admission system assembly.

Conversion from MAN 32/44CR
This is an economical retrofit solution that adds lean-burn technology from the MAN 51/60DF. Due to the high level of component compatibility, the engine can be easily re-machined on board.

Further power solutions
- MAN 21/31 GenSet
- MAN 27/38 GenSet
Drilling wells is dangerous enough on land, but doing it underwater, in harsh weather conditions in remote locations, can be extremely demanding.

Drill ships and semi-submersible rigs are used for exploration and well development in water depths of up to 3,000 meters. Jack-ups are usually deployed in shallow waters.

Whereas fixed rigs do not need propulsion power, drill ships generally also require power for dynamic positioning at the place where they are drilling. Among the dangers they have to avoid are the disconnection of drilling equipment and blowouts.

The drilling equipment requires a robust and reliable power source ensuring safety and efficiency with minimal maintenance. Electrical power generation systems have to be blackout free and able to handle big and immediate load steps.
State of the art efficiency

MAN 32/44CR GenSet

Quick start-up times and large load steps are two key characteristics of the MAN 32/44CR GenSet. The engine easily matches different load profiles and provides excellent load acceptance. The MAN SaCoSaone management system can detect a load increase at an early stage and improves the load response of the engine significantly by activating a boost injection in the common rail control.

Benefits

Highly efficient common rail technology
Employing cutting edge technology to fulfill the ecological and commercial vision of your company

Quick load acceptance
Best dynamic ship operation in class

Low operating costs
Thanks to SFOC savings due to in-house development MAN ECOMAP exhaust emissions

Blackout prevention by hybrid propulsion
MAN HyProp ECO is a hybrid propulsion system that prevents blackouts and increases general efficiency. It uses an energy storage system to boost the diesel engine’s performance (fast load application, reduced smoke, peak shaving). It also reduces fuel consumption by increasing propeller efficiency.

Common rail technology
Independent, flexible setting of injection timing, duration and pressure at any load point ensures optimum performance of the engine, especially in off-design conditions. Developed completely in-house, our common rail system represents the core of a technology that has a reliable future.

Boost injection
This feature significantly improves the load response of the engine by activating a boost injection in the common rail control at a very early stage when a load increase is detected. By raising engine torque, speed drops are avoided, recovery times are short and there is no additional air consumption.

Ease of maintenance
Easy to operate and simple to maintain, the MAN 32/44CR GenSet is efficient in every way.

Further power solutions
MAN 27/38 GenSet
MAN PA6B OG GenSet
Light well intervention vessels (LWIV) carry out maintenance and other kinds of work on wellheads such as removing debris and deposits or manipulating valves on Christmas trees. Their work results in better exploitation of underwater wells. Semi-submersible crane vessels (SSCV) are used for installing and removing heavy equipment and wells.

For well-managed wells

Dynamically positioned LWIVs can perform light well interventions more cost-effectively than the larger drilling vessels and rigs. The ships have to face up to harsh weather conditions and the demands of dynamic vessel positioning.

In terms of power generation, these ships require efficient and robust GenSets that can handle big and immediate load steps, are quick in emergency start-up, and do not suffer from blackouts.
The compact, lightweight and durable MAN PA6B OG (offshore GenSet) was especially designed for semi-submersibles and fulfills all the operating demands of this sector. The engine is highly resistant to shock and can deal with tilts of up to 25°. It offers quick start-up times and black start capability. It also copes well with load increases and long-term, low-load operation. The basic engine design has proven itself over uncountable running hours. Its small size enables higher deck load capacity on semi-submersible vessels.

Benefits

- **High reliability**
  Mean time between failure > 2,000h and reliability > 99%

- **Ready for installation in the engine room**
  Fully assembled with pre-adjusted cooling system for short commissioning times

- **Great power-to-weight ratio**
  Compact design reduces size of engine room and improves variable deck loading capability

- **Environmental compliance with MAN SCR**
  In developing the new offshore GenSet, the original MAN PA6B engine has been adapted to meet current market demands. The MAN PA6B OG is now IMO Tier II compliant and surpasses IMO Tier III regulations in combination with the MAN SCR (selective catalytic reduction) system.

Black start capability
Redundant starting system and integrated hot standby function allows engine start with load acceptance in < 10 seconds.

Fully integrated cooling system
The combination cooler integrated into the base frame cools fresh water, lube and fuel oil, reducing piping, engine room size and installation effort.

Ready for installation at the shipyard
Fully assembled GenSet, tested at MAN Energy Solutions with pre-adjusted internal cooling system to reduce commissioning time.

Further power solutions
MAN 27/38 GenSet
MAN 32/44CR GenSet
Upstream equipment

MAN Energy Solutions: one-source provider of compression and power generation systems

For decades, we have been investing extensively in the research and development of compression and power generation technologies. The result is a comprehensive product portfolio, unique in its depth and level of innovation. These are products built for the tough requirements of the oil and gas market. For total reliability, absolute availability and uncompromising efficiency.

Modular and standardized compressor package

Our single-lift package is a proven compressor solution for all applications. It is made up of pre-defined components, resulting in lower investment costs and shorter lead times. It offers reduced operating costs thanks to its unrivaled reliability and state-of-the-art condition monitoring.

The highly efficient barrel-type compressor is driven by an electric motor or a gas turbine. Its robust design is suitable for exploration and production processes such as gas lift (EDR), gas injection and gas export. Inlet flow rates range from 200 to 230,000 Am³/h and discharge pressures go up to 800 bar.

Your source of upstream equipment

Not only are all MAN components made to fit perfectly with each other, we also offer you one point of contact for responsibility, expertise and service.

- Offshore power modules
- Propulsion and auxiliary engines
- Centrifugal and screw compressor packages
- Gas and steam turbine generator sets
MAN PrimeServ is the dedicated MAN Energy Solutions service brand. Via a network of over 100 service centers worldwide, MAN PrimeServ provides 24/7 service across the globe. Our range of services includes technical support, consulting and OEM spares, as well as maintenance, repair and comprehensive individualized service plans.

MAN PrimeServ provides:

- Prompt delivery of high-demand OEM spare parts within 24 hours
- Fast, reliable and competent customer support
- Individually tailored O&M contracts
- Ongoing training and qualification of operators and maintenance staff
- Global service, 24 hours a day, 365 days a year
- Diagnosis and troubleshooting with our high-performance online service
We offer retrofitting and upgrade services to bring engines and turbochargers already in service up to the very latest standards of performance and efficiency.

Using the latest digital technology, we enable you to maximize the performance and availability of your MAN equipment by accessing real-time data analysis, remote support and rapid solutions. We also offer an extensive range of training courses at MAN PrimeServ academies around the world.

Our service does not vary according to location. We know that a vessel may be built in Asia, operated in Europe for ten years and then move to Africa for the next ten years. That does not alter our focus on dedicated training, fast delivery of strategic spare parts, a comprehensive approach, or our tailored maintenance contracts.

For more information please visit www.man-es.com/primeserv
Get your engines started …

An interactive experience
Download our MAN Brochure Store app from the App Store or Google Play Store. Use its exciting interactive features to explore our complete range of products and services. Suitable for iPhone, iPad and Android.

Explore our latest news via an app
DieselFacts brings you the most recent news from the world of two-stroke and four-stroke engines, including the latest technical papers, in-depth features and videos.