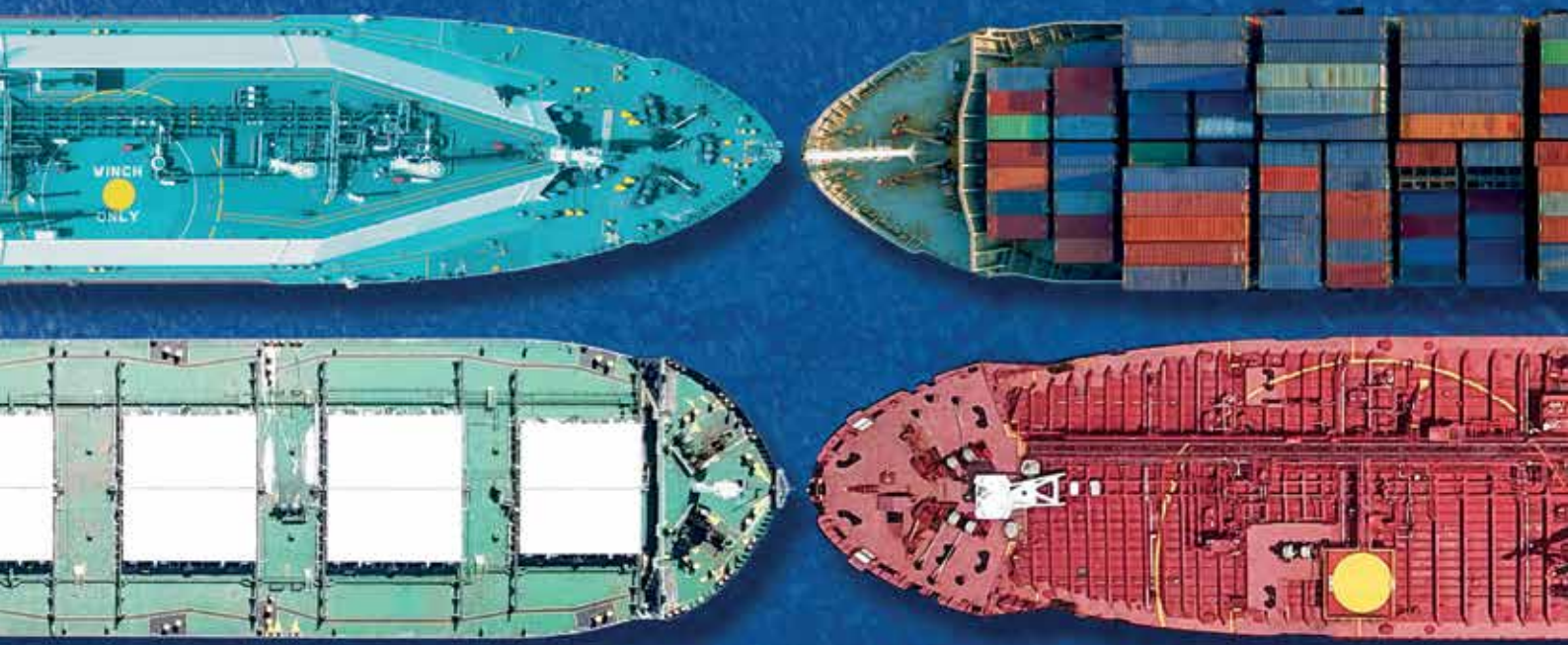
# Whatever your vessel, we have a fuel solution that fits

**MAN Energy Solutions**
Future in the making




**Introducing the upgraded MAN B&W ME-GI Mk. 2 and the new low-pressure MAN B&W ME-GA two-stroke dual-fuel engines.**

# Future in the making

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, LPG, methanol, ethane, and digitized services.

In the competitive field of ocean transport with its fluctuating fuel prices, we offer cost-effective propulsion systems and GenSets that comply with all emission legislations and meet strict safety requirements.

# Future-proof your investments

**The new MAN B&W ME-GI Mk. 2 two-stroke engine improves on one of the industry's most trusted platforms to deliver even greater performance and flexibility.**

The MAN B&W ME-GI two-stroke engine was welcomed by shipowners worldwide. Based on proven MAN B&W engine technology, it delivered an efficient, flexible dual-fuel propulsion solution that could operate on fuel oils, LNG and ethane. Today, with more than half a million operating hours, it remains a stable and versatile engine platform.

**Welcome to the MAN B&W ME-GI Mk. 2**

MAN Energy Solutions is now introducing the MAN B&W ME-GI Mk. 2. The new engine builds upon many of the features that made ME-GI one of the most trusted names in dual-fuel engine design.

The MAN B&W ME-GI Mk. 2 is based on the diesel principle. It is essentially an ME-C engine with an additional, electronically controlled gas injection system.

The simplified Mk. 2 improves reliability and minimizes operational costs, while providing a large degree of flexibility for meeting emissions regulations.

**Designed to maximize profitability**

The ME-GI is built for low OPEX, delivering the same industry-leading thermal efficiency no matter which fuel you are using. This is a huge advantage in a market where fuel prices are fluctuating and LNG bunkering will become the norm.

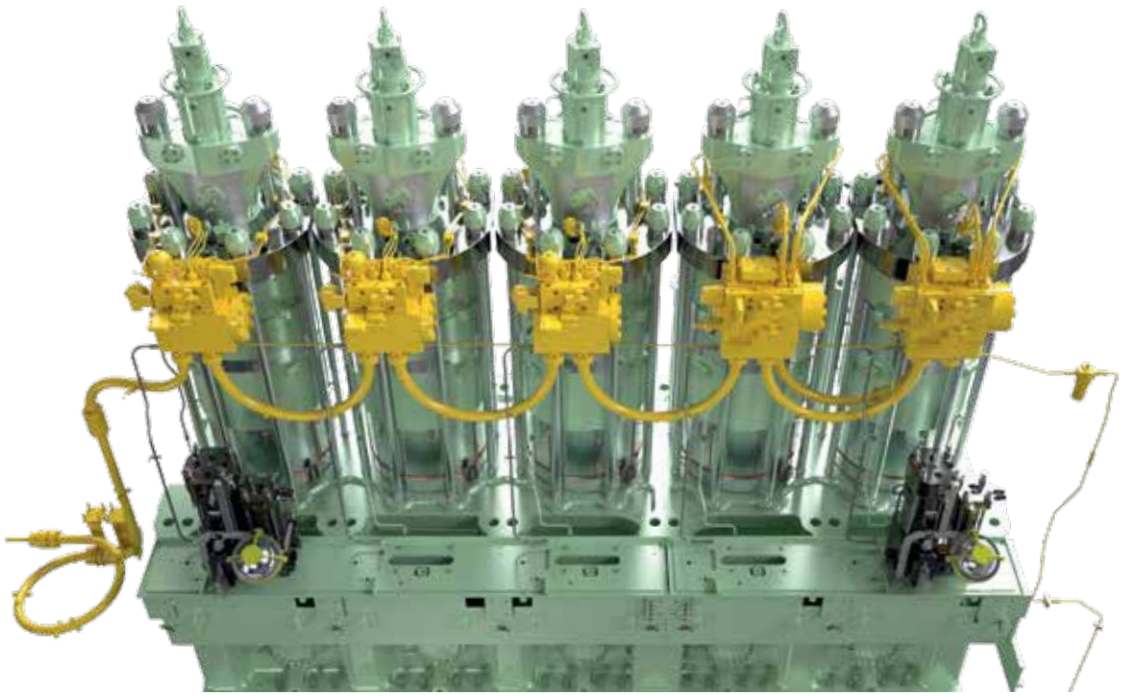
The MAN B&W ME-GI Mk. 2's CAPEX is lowered, as auxiliary equipment costs have been reduced and the engine's installation is simplified. In addition, key components have been updated to improve performance and deliver a more environmentally friendly solution.

**MAN B&W ME-GI Mk. 2 key advantages:**

- Proven two-stroke MAN B&W engine technology
- Low OPEX with highest thermal efficiency on the market
- Minimal environmental impact (low GHG, negligible methane slip, reduced $CO_2$)
- Flexible operation using fuel oil, LNG or ethane
- Knocking is not an issue
- Any fuel-oil/gas ratio can be burned
- Supports WHR
- Retrofit options for ME-C engines available

# Next generation performance and efficiency

## MAN B&W ME-GI Mk. 2



# The MAN B&W ME-GI Mk. 2 incorporates a range of key component upgrades that improve reliability, maximize efficiency and lower OPEX, helping you to stay competitive in a challenging market.

**Simplified piping system**

Simplified installation is achieved by removing the high-pressure control oil pipes, the gas chain return pipes and the hydraulic activation piping. At the same time, the gas accumulator design has been optimized to achieve a more compact solution.

With fewer components, maintenance costs are lowered.

**New gas block**

As a brand new feature for two-stroke dual fuel engines, the new MAN B&W ME-GI Mk. 2 gas block design with improved window valve enables cut-out of individual cylinders operating on gas while allowing them to continue operation on fuel oil.

Mk. 1

Mk. 2

**Updated pilot oil injection system**

One of the most notable enhancements of the MAN B&W ME-GI Mk. 2 is the introduction of the main fuel oil injection valve with a two-step functionality that reduces the nozzle hole area when operating on gas and pilot fuel and expands it when operating on diesel and specified dual fuel (SDF). The two-step functionality enables the pilot oil consumption to be lowered to just 0.5%, depending on the operating mode.

**The PVU (pump vaporiser unit)**

The ME-GI pump vaporiser unit is a standardized, cost-efficient solution, designed specifically for our ME-GI type engines. It features embedded redundancy (3 x 50%) and integration with the ME-GI engine control system and user interface. The highly compact design also reduces the unit's footprint and weight.

PVU

Nozzle

**MAN B&W ME-GI Mk. 2 at a glance:**

- **Diesel cycle, duel fuel two-stroke engine with precise and high-response direct gas injection**
- **Simpler design for greater reliability**
- **Highest combustion stability, with no load or ambient limitation in dual-fuel mode operation**
- **Features pilot oil consumption down to 0.5%**
- **Highest flexibility in dual-fuel operational range (5%-110% load)**
- **Gas cylinder cut-out (CCO)**
- **Updated pilot injection system**
- **Exceptional reliability and efficiency**

# The perfect retrofit solution

# Gas is a green, economic and widely available fuel, which is why converting your ME-C engine to an ME-GI dual-fuel solution is an excellent way to extend the lifetime of your investment.

In face of ever-tightening environmental regulations and fluctuating market conditions, it is crucial that you safeguard your engines and business for the future.

Retrofitting your vessel with an ME-GI dual-fuel solution means you can easily switch between different fuel types, allowing you to take advantage of optimal fuel prices and guarantee full compliance with upcoming emissions restrictions.

**ME-GI retrofit solutions**

The ME-GI concept is a cost-efficient solution for retrofitting an ME-C engine, delivering dual fuel capability, improved EEDI, greater operating flexibility and lower $NO_x$, PM and $CO_2$ emissions.

The technology and concept are well proven, utilizing the diesel cycle for high efficiency regardless of fuel choice.

This means that your operation profile and load response will stay the same as with a conventional ME-C engine, with zero fuel slip and knocking issues.

The retrofit can be completed simultaneously with normal docking. References are available on request.

**A complete conversion package**

MAN PrimeServ can provide a complete conversion package on a turnkey basis, taking full responsibility for the entire project. Our project managers and specialist engineers will guide you through the entire process smoothly and quickly to minimize your vessel's downtime.

Contact MAN PrimeServ today to begin exploring your options. Find out more: www.man-es.com/services

# A new low-pressure two-stroke dual-fuel engine

**Introducing the MAN B&W ME-GA**

MAN Energy Solutions is developing a new low-pressure two-stroke dual-fuel engine to supplement the ME-GI platform and to fill the gap in our extensive portfolio of fuel-efficient, high performance engines.

The new MAN B&W ME-GA will offer a low CAPEX solution that is well suited to certain vessel types and applications, for example LNG carriers which are able to use 'boil-off' gas as a source of fuel. With minimal $NO_X$ emissions and full Tier III compliance in gas mode, the MAN B&W ME-GA is also ideal to ensure that your vessel meets upcoming emissions regulations.

The MAN B&W ME-GA two-stroke dual-fuel engine can be ordered today for delivery in 2021.

**Key advantages**

Low CAPEX:
- Cost-optimized boil-off gas handling
- Engine design facilitates simple application
- Low maintenance costs of the fuel gas supply system

Additional benefits:
- Competitive gas and pilot oil consumption
- Low NOx emissions
- Tier III compliance in gas mode

# MAN PrimeServ

# Service with passion

**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.**

**365**
days a year

**24**
hours a day

MAN Energy Solutions

**MAN PrimeServ's aim is to provide**

- 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

**MAN Energy Solutions and legacy brands**

MAN PrimeServ is our brand name for high-quality aftersales support for the entire MAN Energy Solutions product portfolio. Through refinements to our products and repair techniques, we ensure and enhance our technological leadership and technical expertise as an Original Equipment Manufacturer (OEM) for the brands united under MAN Energy Solutions.

# Worldwide service

**We offer retrofitting and upgrade services to bring engines and turbo-chargers 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**

# 100

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worldwide

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