

MAN Energy Solutions
86224 Augsburg, Germany
P + 49 821 322-0
F + 49 821 322-3382
info@man-es.com
www.man-es.com



Future in the making

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MAN Energy Solutions



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energy
entire
prism

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A legacy of innovation

“The name MAN Energy Solutions stands for the company’s new strategic and technological direction, and for the transformation of energy into concrete benefits, both economic and social.”

Dr. Uwe Lauber, CEO MAN Energy Solutions

Our company, Maschinenfabrik Augsburg-Nürnberg, has been at the forefront of energy and power generation for more than 250 years. Headquartered in Germany, we employ some 14,000 people at over 120 sites globally.

Our practical name belies a deeper truth: we’ve pushed the boundaries of what’s possible with technology for generations. Beginning with Rudolf Diesel’s revolutionary engine, its descendants now power half the world’s shipping and trade. Now, we’re building on this legacy, by incorporating a more holistic view on energy into our company’s identity. In all its shapes and sizes, energy plays a fundamental role in the future of our planet.

To reflect this new outlook, we’ve changed our name to MAN Energy Solutions. Together, with our customers, partners and suppliers, we aim to transform energy into sustainable progress and prosperity.

This is our mission.
This is future in the making.

From control to coexistence

We're driven to be exceptional. To build bigger, roam further, connect people and economies together, faster than ever before. Now, perhaps later than we should have, we as humans have realized that our drive to be more productive and efficient has taken a toll on the natural world. How can we balance the need for energy and efficiency with the fundamental truth that the environment has suffered? Industry must evolve to meet the myriad challenges this fact poses.

MAN Energy Solutions is ready. We know that industry and energy can't transform overnight, but that each step we take works towards a better tomorrow. While our engines drive the economy of today, our new power solutions will drive sustainability tomorrow. While our process feeds the population today, our innovation will ensure food security tomorrow. We understand that high performance isn't mutually exclusive with environmental harmony.

Together, we will provide the technical solutions that will drive the global economy into a new era. With our partners and customers, we will lead the transition towards a carbon-neutral world.

250
years of advanced engineering

14,318
employees worldwide

More than

3

billion Euros in
annual revenue

What drives MAN Energy Solutions?

Decarbonization calls for new technologies

By 2050, industrialized countries must cut their emissions by at least 80% compared to 1990 levels. We believe it's possible with improved technology and the right outlook.

Digitalization makes entirely new business models possible

Intelligent software can be embedded in every device, allowing accurate analytics and unprecedented operational and business insights. We aim to pioneer a digital transformation.

Customers can be the partners in a successful future

Guiding our customers towards optimal solutions, no matter the industry, gives us the best chance to succeed with our ecological and economic goals.

120
service sites worldwide



Piloting your future through waves of change

Marine Engines & Systems

With growing concern about the state of our oceans and waterways, marine industries face new challenges, tougher regulations and increased scrutiny. There's mounting pressure to show progress towards more environmentally sustainable technologies and operating standards. As the world's leading provider of large-bore diesel engines, turbomachinery, and integrated power systems, MAN Energy Solutions bears part of this responsibility.

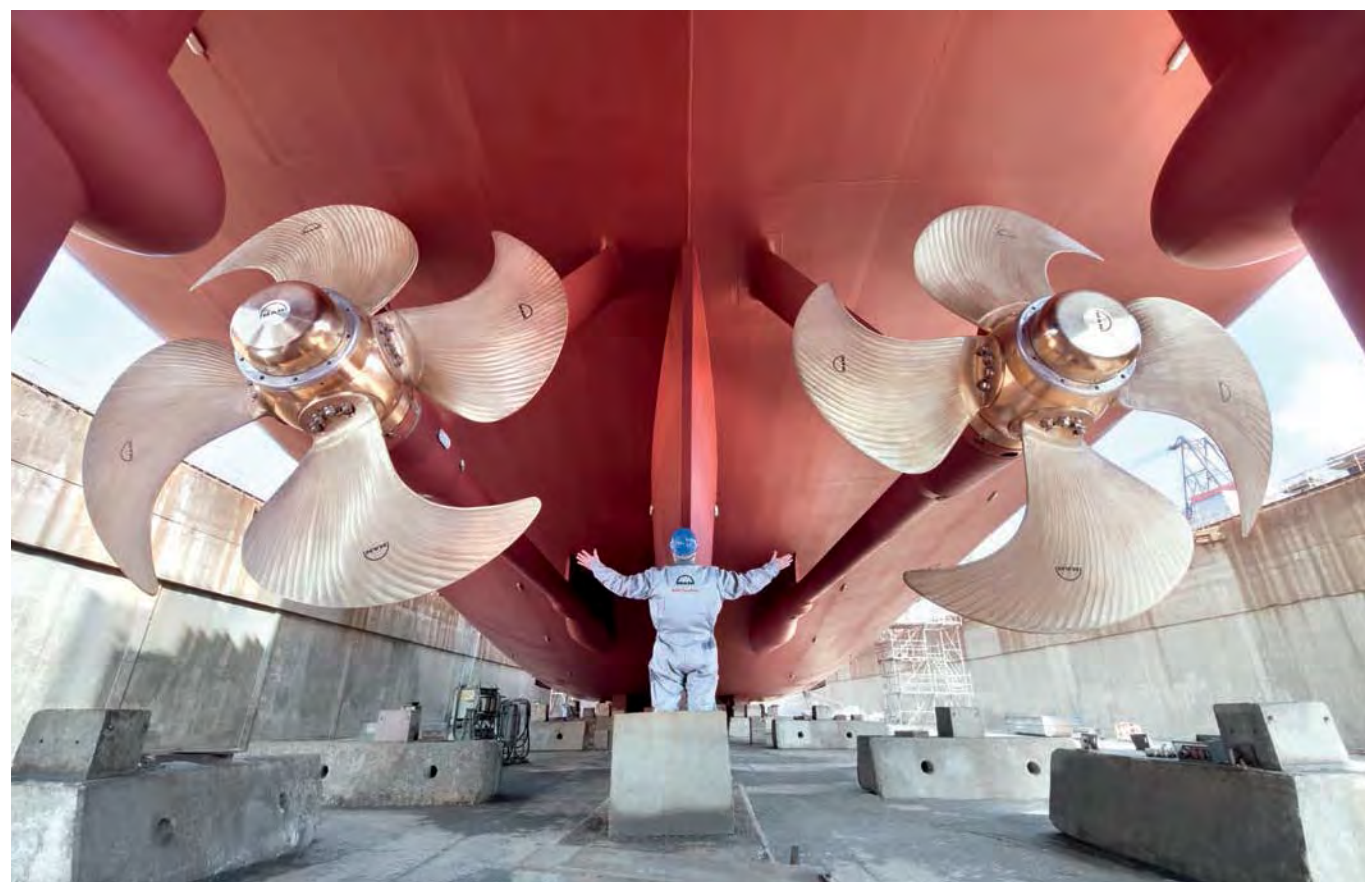
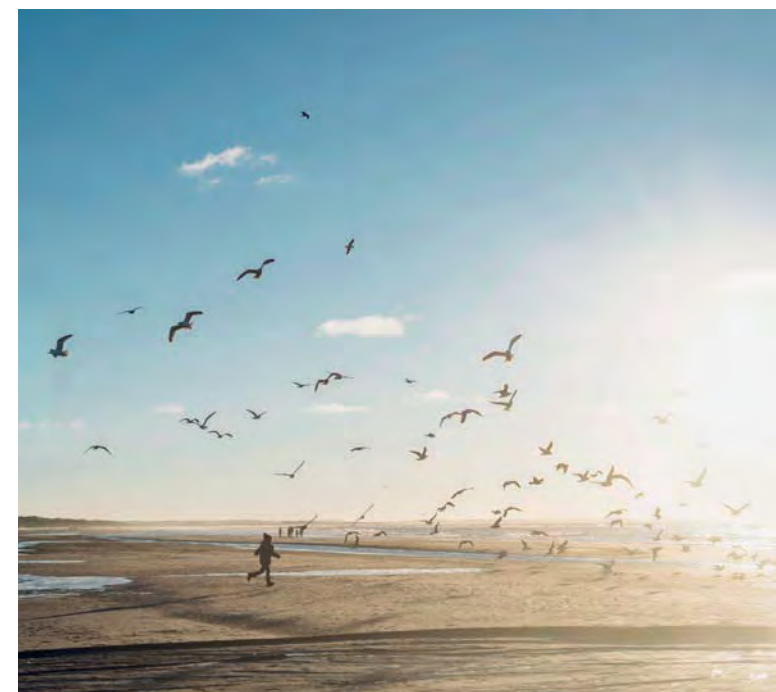
To make more environmentally friendly energy systems a reality without compromising on their reliability and cost-effectiveness, various techniques need to be combined and managed. With a close eye on our customers' needs, we develop holistic propulsion systems, combining both innovative construction methods and materials with smart management solutions, interacting seamlessly to be sustainable and efficient.

Engineered for your sustainability

We at MAN Energy Solutions offer highly reliable and proven, two-stroke, four-stroke propulsion and genset engines. Each one is designed to comply with all modern emissions legislation. When you choose MAN, you choose engines that meet or exceed the strict safety requirements that vessels operate under when sailing in environmentally sensitive regions.

20%

total fuel savings possible with
a holistic retrofitting approach



Our engines cater for all ship sizes and applications, from tugs and small-scale fishing vessels to ULCVs and tankers. Half the world's shipping sails under the power of MAN Energy Solutions, and we recognize that each step we take to make our engines more efficient can have a measurable effect on the environment and your bottom line.

Although shipping is already the most efficient form of bulk transportation, we know that more can be done. To this end, we offer MAN ECO CONTROL, a portfolio of technologies that help you optimize a ship's performance in terms of emissions, economy and operation and let you benefit from smart processes, efficient operation, and predictive maintenance services. It's another step in the right direction.

**We drive the world's
first LNG-powered fishing
trawler**

MAN Energy Solutions provides complete propulsion packages and fuel-gas systems for the world's first fishing vessel with LNG propulsion. A new-build 86-meter purse seiner, the 'Libas' will be built by Cemre Shipyard in Istanbul, featuring an MAN 6L51/60DF main engine, Renk gearbox, MAN Alpha propeller system and MAN Cryo LNG fuel-gas system.

We believe LNG-powered shipping is a very real step towards the goal of a climate-neutral shipping industry. Looking into the future, we're developing CO₂-neutral, synthetic natural gas-powered engines as a sustainable alternative to traditional power sources.

Generating energy for generations to come

Energy & Storage

Energy markets around the world are changing rapidly. The market share of renewable energy sources is growing, and grid infrastructures are becoming more localized. Fuel costs continue to rise, and massive investments are needed to make existing power plants compliant with ever stricter regulations. What's more, the major nations of the world have committed to decarbonization as a way of combating climate change effectively. To achieve this, future power markets will need to focus on implementing sustainable, low-carbon energy solutions and technologies.

A partner to the power industry for decades, MAN Energy Solutions maintains longstanding relationships with electrical utility companies all over the world. In today's changing energy landscape, reliability of supply and operational flexibility are both growing concerns for energy providers. In these challenging times, we know it's not only necessary to design cost-effective energy generation systems, but also sustainable ones. Short-term thinking has no place in the energy sector. If you're a player in the business of power, you know that effectively controlling costs without compromising on longevity is a decisive competitive edge. MAN Energy Solutions is here to provide you with solutions that give the economic flexibility you need for action.

The power of committing to change

To provide reliable, cost-effective power in today's volatile energy landscape, providers need to ensure a reliable power supply that offers operational flexibility. This is essential to fulfill basic demands, ensure secure, stable systems, and promote positive economic development.



45%

decrease in CO₂ emissions thanks to hybrid-engine power plants

When it comes to ensuring reliability and securing the energy supply, MAN offers unparalleled expertise and experience in power generation, combined with the right products and solutions to suit diverse energy markets.

We have a 360-degree perspective on power plant engineering, from providing ideal technological solutions and compliance with energy policy standards to ensuring operations stay cost-effective. Our versatile, highly efficient power plant solutions are designed to meet all your requirements, whether you're a state operator or private company, specifically in terms of optimized capital and operation expenditures and reliability.

MAN Energy Solutions provides holistic, sustainable power solutions from a single source—combined with complete long-term service packages—thermal power plants (engine-, gas- or steam turbine-based), renewables (solar, wind, hydro, biomass, etc.) and energy storage (battery, power-to-gas, electrothermal, liquid air). Using renewable energy for power generation is the end goal, but until they match the reliability and output of conventional power sources, our hybrid power solutions are there to bridge the gap in the most environmentally-friendly and economical ways.



Hybrid wind-diesel powers paradise

Together with partners, MAN Energy Solutions has built a wind-diesel hybrid power plant on the Caribbean island of Bonaire. While wind power is the primary energy source, the engine power plant (running on biodiesel, diesel oil and HFO) kicks in during calm periods or peaks in demand to ensure the population of the island has a reliable power supply.

Meeting your demand for transformation

Oil & Gas

The oil and gas industry, upstream, midstream and downstream included, is facing a profound change in how it is perceived by the international community. And that change in perception is coupled with ambitious emission reduction targets set by governments and environmental watchdogs. However, oil and gas still drives the global economy, and so it rests on the industry to become more energy-efficient and cost-effective.

Even as the world moves towards a carbon-neutral future, global fossil fuel demand continues to grow. This challenges the oil and gas industry to

meet the increased need for energy while simultaneously reducing overall emissions. Such a scenario asks for solutions to support the transition towards a low-carbon world.

MAN Energy Solutions offers intelligent, sustainable solutions for all three sectors of the oil and gas industry, helping them meet the challenges of the twenty-first century head-on.



Adapting to the climate of a changing industry, together



1.5°C
target global temperature
increase limit in Paris
Agreement



Accelerating and deploying sustainable solutions and technologies will be at the core of future oil and gas markets. It's our firm belief that we can use our available resources more effectively, reducing the carbon footprint of oil and gas operations in the process.

MAN subsea technology keeps Åsgard productive

Discovered in 1981, the Åsgard field is a crucial part of the Norwegian oil, gas and condensate industries. While the natural pressure of the reservoirs is constantly decreasing, MAN's subsea motor-compressor units are helping extend their productive life by another 15 years. This unique solution, exclusive to MAN, has proven itself both efficient and reliable. It has officially reached the highest Technology Readiness Level (TRL) of 7, with both its trains surpassing 10,000 operating hours. The adapted subsea HOFIM™ (High-Speed, Oil-Free, Integrated Motor) features a hermetically sealed motor design, casings designed for 220 bar pressure, a 7-axes active magnetic bearing system and a special cooling gas extraction system. Subsea technology not only saves investment costs, but also raises recovery rates while reducing the energy consumption and CO₂ emissions of oil and gas production.

As technologies in the oil and gas industry become more sophisticated, operations are also becoming more complex. Nevertheless, it's important to reconfigure operations to become more efficient and cost-effective, and to reduce their carbon footprint. Our integrated systems and solutions to help the global oil and gas industry improve, step by step, day by day.

We offer a comprehensive portfolio of unique technologies and services to reduce emissions. Our reliable, energy-efficient solutions are purposely designed to reduce waste and minimize resource consumption along the entire value chain—from refinery to transport, and on to the processing of these valuable resources.

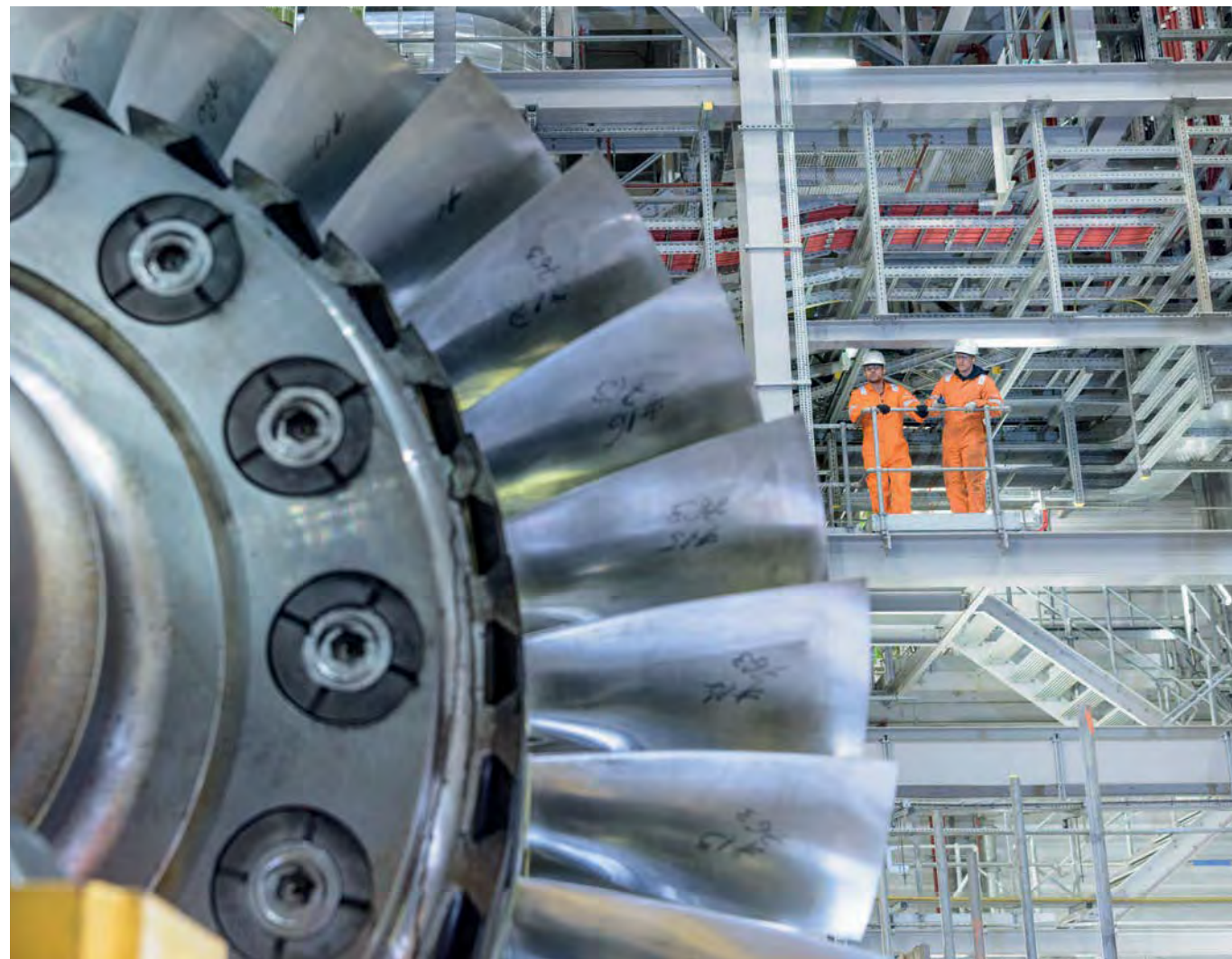
Always refining your processes

Process Industry

The world is in flux. The troubling megatrends of climate change, population growth and resource scarcity are leading humanity down a dangerous road to diminished food and power security. To combat this, we need to change the way we approach manufacturing and refining. Rising energy prices and an environment under pressure means it's our responsibility to make the most of what we have and preserve what remains for our children. The days of externalizing environmental and human costs are over.

To navigate this changing business landscape, companies are facing questions over how they will improve their technology, further reduce their environmental footprint, and increase resource efficiency. MAN Energy Solutions is helping answer these difficult questions by developing innovative technologies, refining and improving mature technologies, and streamlining processes and manpower.

Production with purpose



The manufacturing and refining sectors of the global economy are incredibly diverse. Consequently, MAN Energy Solutions offers a wide array of specialized products and solutions that cater to everything from paper to pipelines and from fertilizer to ferrous metals. MAN Energy Solutions is found in both the largest industrial plants in the world and in smaller, single-site operations. At the heart of any factory or refinery, there's a good chance you'll find us.

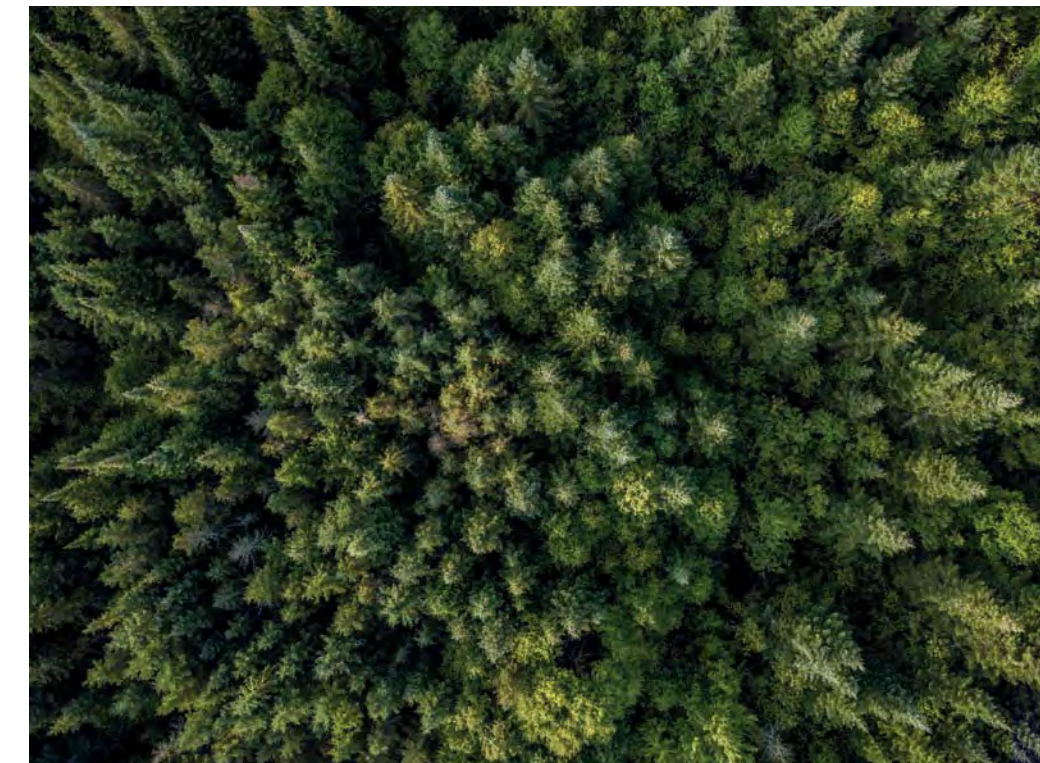
The challenges and needs of these plants are just as diverse, but they do have commonalities. They require energy: sustainable, efficient and cost-effective energy. They face the challenge of reducing waste and emissions, especially in the face of the Paris Climate Agreement. And, they need to increase the efficiency of their output to meet the demands of a growing population.

With the help of MAN Energy Solutions, industries worldwide are improving their energy performance with a range

of measures, from installing advanced energy-efficient technology and re-using by-product energy to substituting fossil fuel with lower-carbon energy sources. Minimizing the energy and emission footprint also helps achieve economic goals: increased resilience to fluctuating energy prices and lower operating costs.

Storage with unlimited potential

MAN Energy Solutions and ABB Switzerland have devised a way to use surplus renewable electricity to generate thermal energy and industrial cooling, which can be stored in insulated reservoirs and then distributed to users. The heat and cold can be converted back into electrical energy on demand. This is the only system that can use, store and distribute three types of energy simultaneously. We call it Electro-Thermal Energy Storage, or ETES.



20%

In its April 2018 report, the World Bank forecast a jump in prices for energy commodities by 20 percent.

Taking sustainable service seriously

Services

We have a philosophy that we've held for over 100 years: our success is measured by your success. And that philosophy is borne out by MAN PrimeServ, our comprehensive portfolio of customized service solutions for increasing service life, improving availability, reducing emissions, or simply for delivering the right spare parts and manpower – on time and in budget. Our benchmark is the operational availability of your equipment and the competitiveness of your products. In addition, we know that downtime and failure can cost more than money. In the high-pressure environments you operate, lives are on the line.

As sustainability becomes a focal point for your business, so it becomes a priority for our services. Limiting wastage in materials, manpower and energy is not just for new installations and products, it's crucially important for maintenance, repair and refits.

Peace of mind is our priority

MAN PrimeServ



At MAN PrimeServ, we understand that different customers need different solutions, tailored to individual requirements.

We also believe that a single point of contact is invaluable for getting things right the first time. Being a full-service provider has been a driving force for us since our founding and our experience leads us to develop new services to solve your challenges in creative ways. This is more than just delivering best-in-class spare parts, upgrade solutions, and technical assistance. It means working as your partner, every step of the way.



365

days of round-the-clock service

Retrofit for the future

At the close of 2017, TOTE Maritime Alaska contracted MAN PrimeServ to retrofit two of their roll-on/-off ships to dual-fuel operation on LNG. A key reason for the upgrade was to significantly reduce the most harmful emissions that result from burning diesel. The investment will be of huge benefit in other ways, too. Not only will the retrofitted engines meet all new emission standards; the new components incorporated during the conversion will significantly extend the ships' working life.

We want to:

Limit global warming to below

2°C

Be carbon neutral by

2050

Moving with
you for a
better **Together**
tomorrow

Addressing the many challenges in the marine, energy and industrial sectors has become the primary mission of MAN Energy Solutions, not only for our customers' long-term success, but for the health of our world as a whole.

From small efficiency gains in individual components, to grand innovations at a systemic level, we're always working towards a better future. Leading the way in advanced engineering for more than two centuries, MAN Energy Solutions employs thousands of people at over one hundred sites worldwide, and every one of us is ready to work with you.

For more information please visit
www.man-es.com